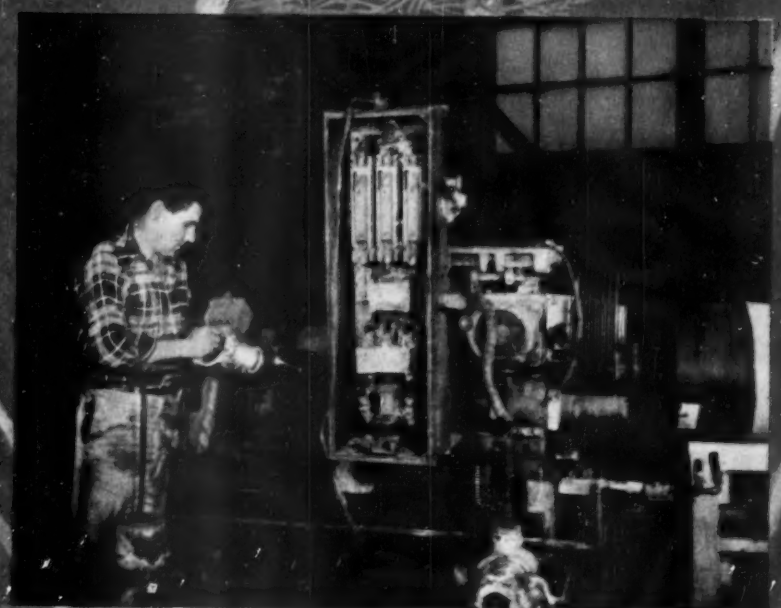
NOVEMBER 23, 1953

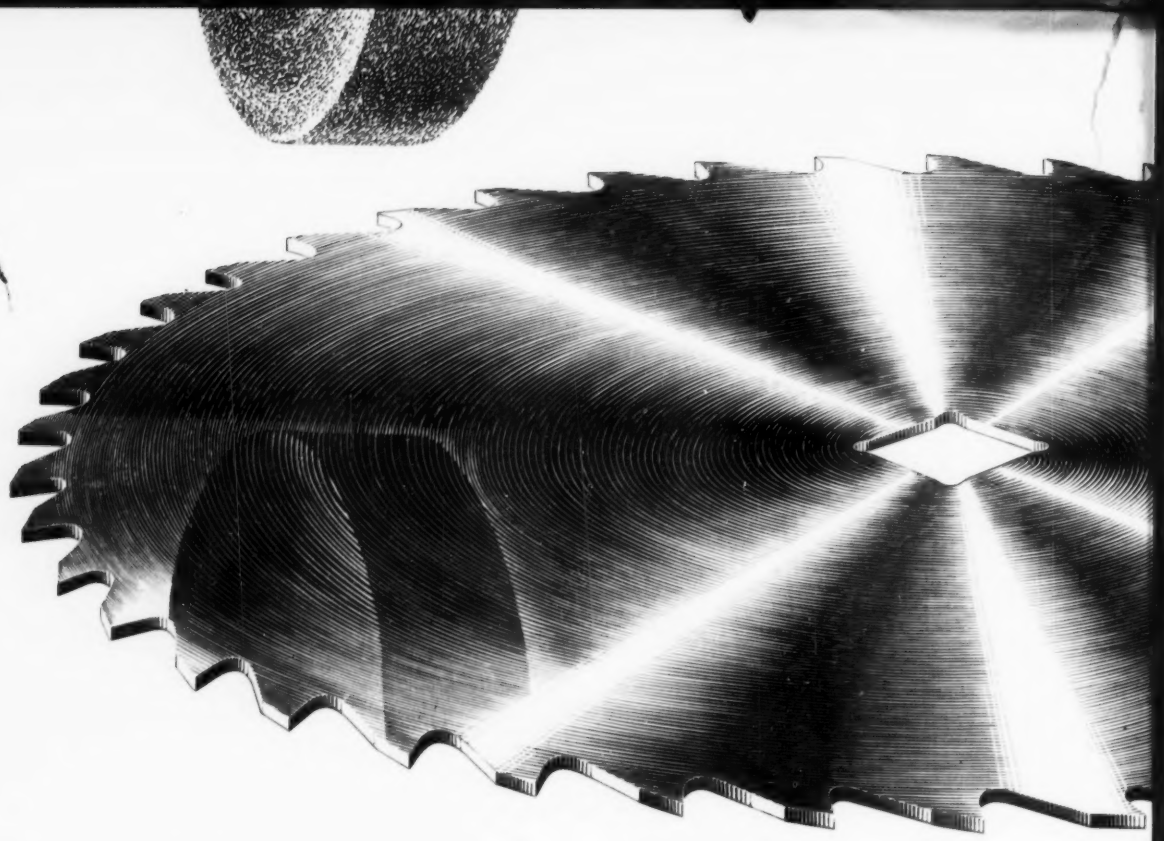
American Machinist

PRICE 50 CENTS

McGRAW HILL MAGAZINE OF METALWORKING PRODUCTION



M TOOLING REBORN FROM FLA



Saw blades ground

190% FASTER

Grinding the surface of a circular saw blade isn't a complicated operation, to be sure. But accuracy and precision are mighty important to the success of the end product. And minutes saved per part add up to an important reduction in manufacturing cost.

Here's a case where a Heald Model 261 Rotary Surface Grinder did the job 190% faster than by previous methods. The grinding operation is performed automatically, with maximum speed and precision, at the push of a button. Swiveling of the chuck produces a .005″ taper toward the center of the blade. And loading is simply a matter of placing the blade over a center locating pin in the 12″ magnetic gap chuck, with a drive pin between teeth as an extra safeguard against slippage under heavy cuts.

Remember—when it comes to precision finishing, it pays to come to Heald.

Internal and Rotary
Surface Grinding Machines
and Bore-Matics

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THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION

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ABC ABP

chips

PHOENIX . . .August 12 will live as the day of the "impossible" industrial fire—when the GM Hydra-Matic plant at Livonia, Mich, went from full production to a flame-filled wreck in just 75 minutes. We reported the fire in detail shortly afterward, but there are three further stories that must be told—one how GM organized to overcome the effects of the holocaust, the second how to rebuild a machine tool that went through the fire, and the third what to do to avoid a similar fire in other plants. All three are of vital interest to you and to all Metalworking—your plant could be next. Thus our current Special Report is 24 pages, half on GM organization and plant design, half on rebuilding machine tools. We suggest you study it.

Data for the Report came from General Motors, many machine-tool builders, the National Board of Fire Underwriters, and other sources. Much of it was collected by Associate Editor Wright (see biog) but other staff members collaborated in preparation. It is a valuable addition to our earlier Report on "Disaster Control" (*AM* —Nov 13, '50), and like the latter is typical of our effort to get beyond the merely sensational facets of technical news to the lesson to be learned from the happening.

Our cover, produced by Staff Artist Van Gorp, combines the flame with the phoenix—that legendary bird that is reborn from the ashes. The phoenix was most often described as an eagle-like bird; ours is as authentic as can be because it is modified from the emblem of the Phoenix Mutual Life Insurance Co. The color photograph, taken by and at Jones & Lamson in Springfield, Vt, shows one of the first steps in rebuilding—cleaning up a lathe before disassembly. The drum at right supplies the steam jenny for further cleaning. For details, see our Special Report.

INTERFEROMETER . . . Some months ago, we heard that the super-precise measuring instrument which, used by Michelson, gave Einstein the first evidence of his theory of relativity, is now the most precise measuring device for Metalworking. We asked the owner, George Webber, to tell us about it and its use. His story is the lead article in this issue; he plays with tenths of millionths.

PROGRESSIVE . . . If correctly designed, progressive dies can save stock and parts handling, labor and inspection. Peter Balsells, tool engineer of Dayton, shows seven typical designs for diverse jobs in a tight two pages. Jobs range from a piece with two forms to one involving piercing, blanking, coining, and forming. He goes on to discuss the tricks that made them work.

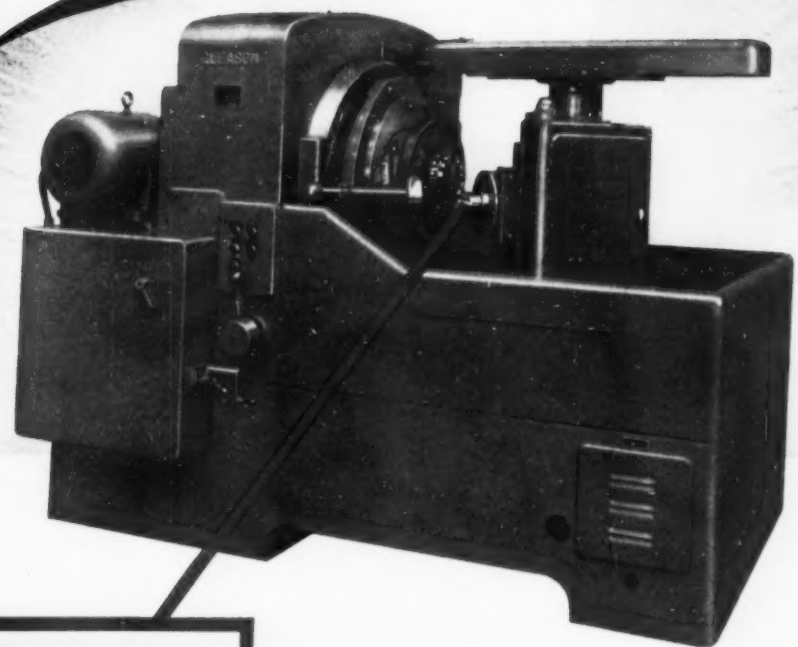
FIRE AGAIN . . . This seemed the proper issue in which to publish Associate Editor Stocker's 2-page story on use of steam to stop fires in ducts from grinders, buffers and polishing machines. Hartford Machine Screw Co pipes in live boiler steam and chokes 'em quickly.

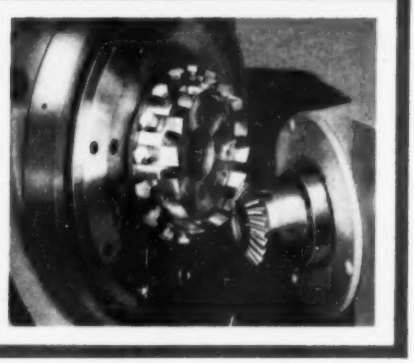
COMING . . . Dec 7 *AM* will include a Special Report on forming methods at an enclosure-making plant, articles on gaging bores, machining die castings, making bevel gears, felt pads for noise isolation, a special in-line machine, and several other features, plus usual departments.

PROJECT ENGINEER . . . John P Wright is our newest associate editor and author of the current Special Report on rebuilding machine tools. He is a tool-design graduate of Brooklyn Poly, and has his industrial teaching degree from NYU. He has also been a tool and die maker at Sperry Gyro, asst plant supervisor at Union Parts Screw Machine Mfg Co, methods engineer at W L Maxson and Arma Corp, machine-shop instructor at NY Trade School, and most recently project engineer at Hughes Aircraft, Culver City, Calif. He's one Easterner who came back from the West Coast.

NEW

NO. 106 HYPOID GENERATOR





This tractor belt pulley drive gear, 25 teeth, 7 D P, 11/16" face, 8620 steel, is completed in one operation at 14.6 sec. per tooth, 5.8 min. floor-to-floor time.

. . . For cutting spiral bevel, ZEROL® bevel, and hypoid gears up to 4 D P, 8½" diameter, 1¼" face

This versatile machine is ideal for small quantities or mass production of gears in the above size range. Greatly increased production rates are assured, because of its improved features, including cam-actuated generating motion, and rigid new-type cutter spindle construction. Many gears which previously required separate roughing and finishing cuts can now be completed in one operation, with marked savings in floor-to-floor time and handling time per piece.

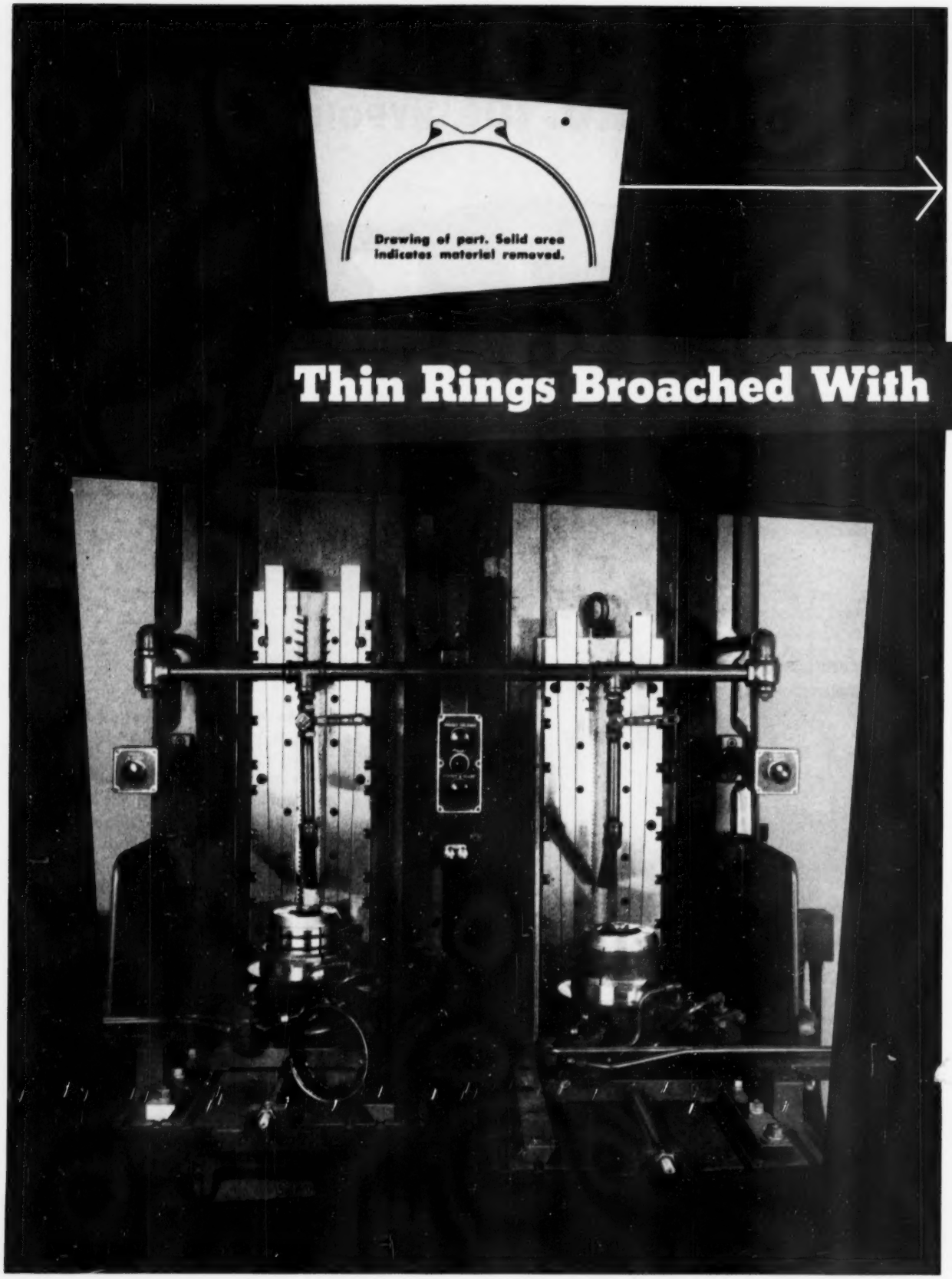
Send prints of your bevel gears for an analysis of the cost savings this new generator can offer you.

GLEASON

GLEASON WORKS

BUILDERS OF BEVEL GEAR MACHINERY FOR OVER 85 YEARS

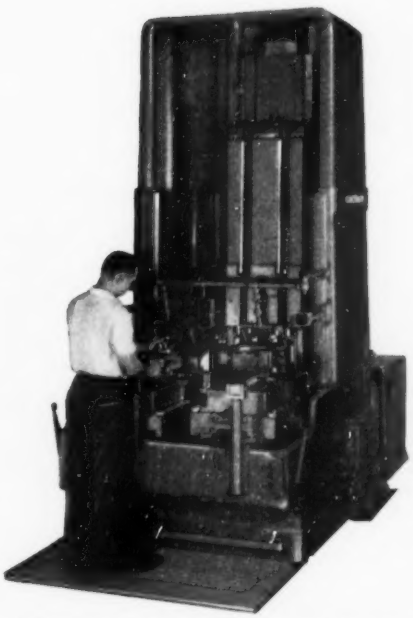
1000 UNIVERSITY AVE. · ROCHESTER 3, NEW YORK


Drawing of part. Solid area indicates material removed.
Thin Rings Broached With

Material ..... Steel
Operation ..... Broach 41° angular grooves
Stock removal ..... From solid
Production ..... 283 per hour
Equipment ..... CINCINNATI Duplex Vertical Hydro-Broach Machine

No Distortion

◀ CINCINNATI Duplex Hydro-Broach tooled up to broach transmission band assembly.



CINCINNATI No. 10-66 Duplex Vertical Hydro-Broach. Catalog No. M-1709-1 contains complete specifications. Write for a copy.

You probably have been stymied more than once by machining operations on thin fragile parts. How one part of this type was taken out of the headache class and set up in a smooth, low-cost production schedule is illustrated here. It shows a CINCINNATI Duplex Vertical Hydro-Broach Machine, tooled up to broach the ears on transmission band assemblies. ¶ There are two hydraulically operated, manually controlled fixtures, one for each ram. While the part in one station is being broached, the operator reloads the other fixture. He can take as much time as necessary because the rams do not go through their cycle until the pre-set cycle buttons are pressed (a CINCINNATI safety feature). Other CINCINNATI advantages for low-cost broaching operations include hardened and ground ways . . . automatic way lubrication, with manual flushing lever . . . dovetail clamp arrangement for interchangeability of broach holders and cutting tools as a unit. Principal features and specifications are outlined in Sweet's Machine Tool Catalog. If you would like to have complete data, write for publication No. M-1709-1.

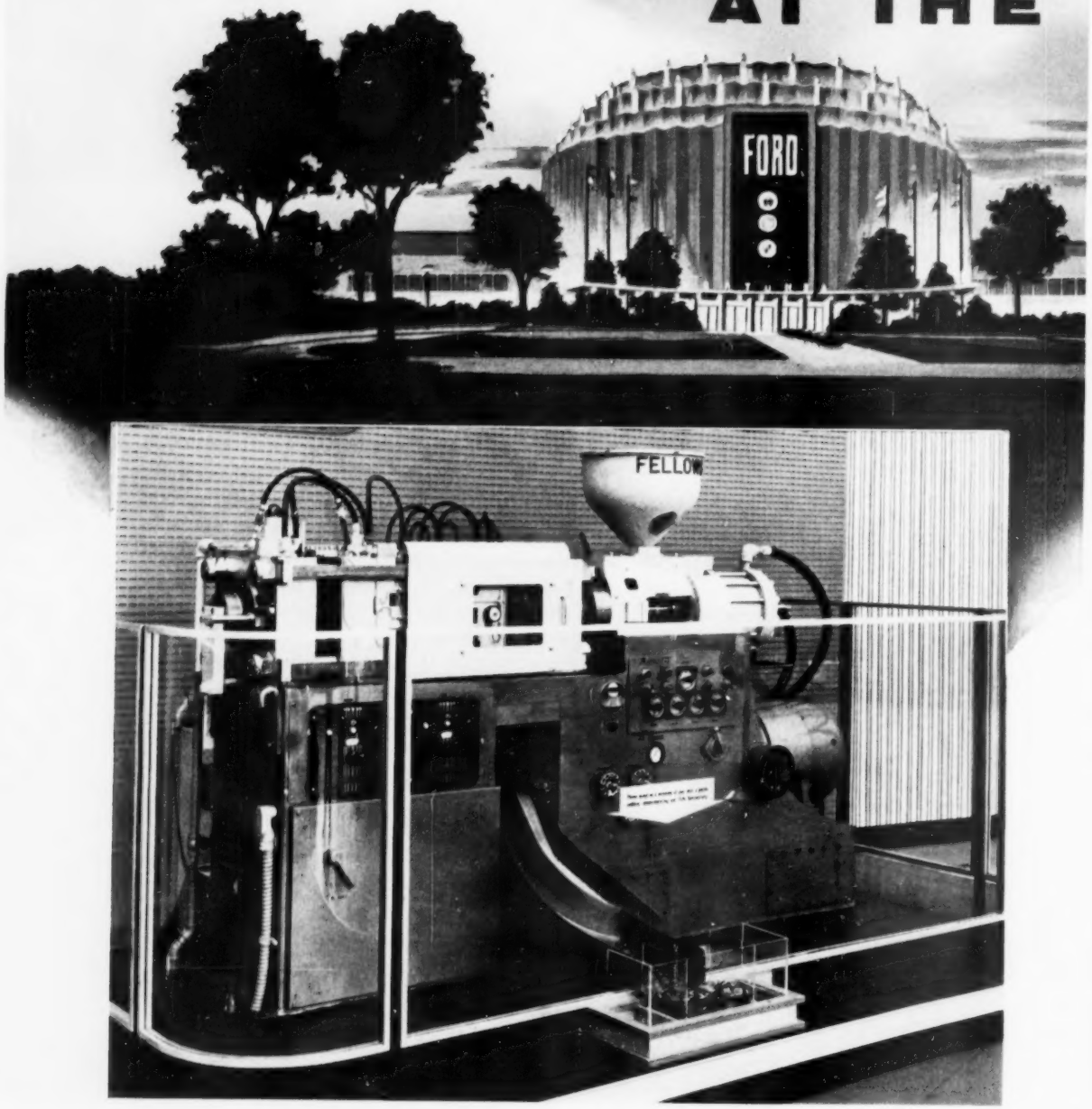
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

CINCINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

Fellows Injection Molding in Actual Operation . . .

AT THE



Fellows injection

FORD ROTUNDA

Every visitor within travel reach of Detroit should, this year, take advantage of the Ford invitation to spend some time at the fabulous Rotunda. This commemoration of 50 years of automotive progress fascinates everyone with its animated displays and exhibits.

Along with machines in miniature is one in full-size—and in actual operation. Ford chose a Fellows Injection Molding Machine to mold souvenir medallions before the visitor's eyes.

The Fellows 1B-3-15 is set up for full-automatic operation. Moreover, the gravity discharge is arranged automatically to separate the pin-point gated medallions from the runner system.

Fellows has pioneered in molding machine advances with—full-automatic operation—
one operator to several machines—faster cycling
to production speeds never before attained.

Why not investigate Fellows money-saving speed and work-saving automatic features. Your nearest Fellows Representative has all the facts.

"This machine is typical of the modern manufacturing equipment created through the use of new materials in processing automotive parts."

Exhibition inscription over Fellows Model 1B-3-15 Injection Molding machine at the Ford Rotunda.

molding equipment

The Fellows Gear Shaper Company, Plastics Machine Division. Head Office and Export Department, Springfield, Vt. Branch Offices: 323 Fisher Building, Detroit 2, Mich.; 5835 West North Ave., Chicago 39, Ill.; 2206 Empire State Building, New York 1, N. Y.

New VAN NORMAN DIVERSIMATIC CENTERLESS GRINDER

Provides Fine Finish to Close Tolerances at High Production Speeds

Diversimatic Does All Conventional Centerless Jobs... Plus Form Grinding

The Van Norman *Diversimatic* is a precision-built centerless grinder that insures fine micro-finishes and close tolerance work at production speeds.

The *Diversimatic* is especially applicable for grinding a variety of small parts such as bearings, drills, valves, shafts, tubes, punches, cap screws and formed parts of two or more diameters or special contours.

The *Diversimatic* is actually three machines in *one*. It is a standard centerless grinder for ordinary throughfeed work . . . a standard grinder for infeed jobs... and equipped with the Crush Forming attachment, it form grinds and does profile work.

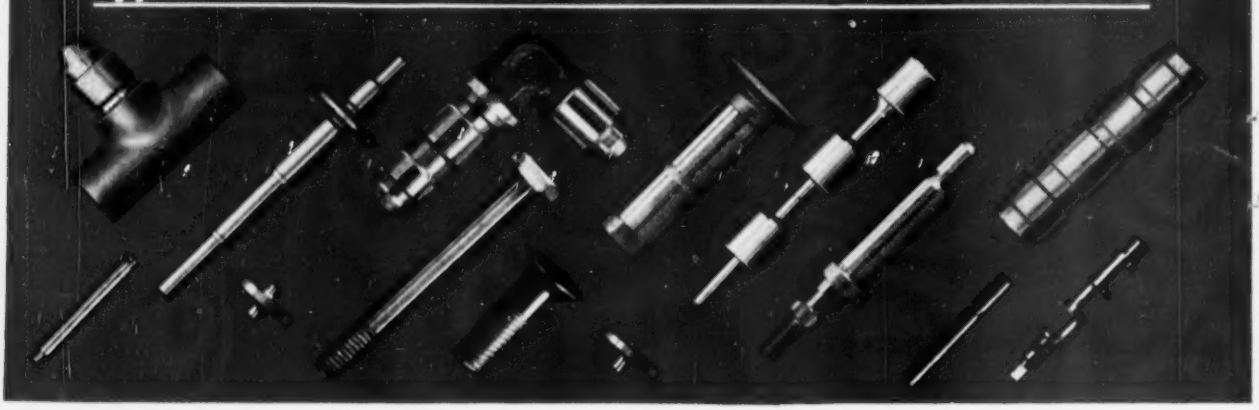
Compare These Diversimatic Features!

- Special, easily removable grinding wheel, spindle quill, with combined double-row super precision ball and roller bearings, sealed and lubricated for life assure trouble-free operation.
- Spindle requires no warm-up period
- Grinding wheel diamond constantly flushed from below with coolant during wheel dressing
- Infinitely variable ¼ h.p. regulating wheel drive, 30 to 300 r.p.m.
- Large 1⅞" 4 thd. Acme Infeed Screw with full length split type nut to compensate for wear
- Work-Rest adjustable for position; may be fixed across the ways or made to feed in and out with the regulating wheel

Get the full facts on the Van Norman Diversimatic Centerless Grinder. See for yourself how this versatile grinder can cut your grinding costs on small shafts, formed shapes, parts of two or more diameters or special contours.

*Registered trademark of the Van Norman Company

Typical Parts Centerless Ground on the DIVERSIMATIC®



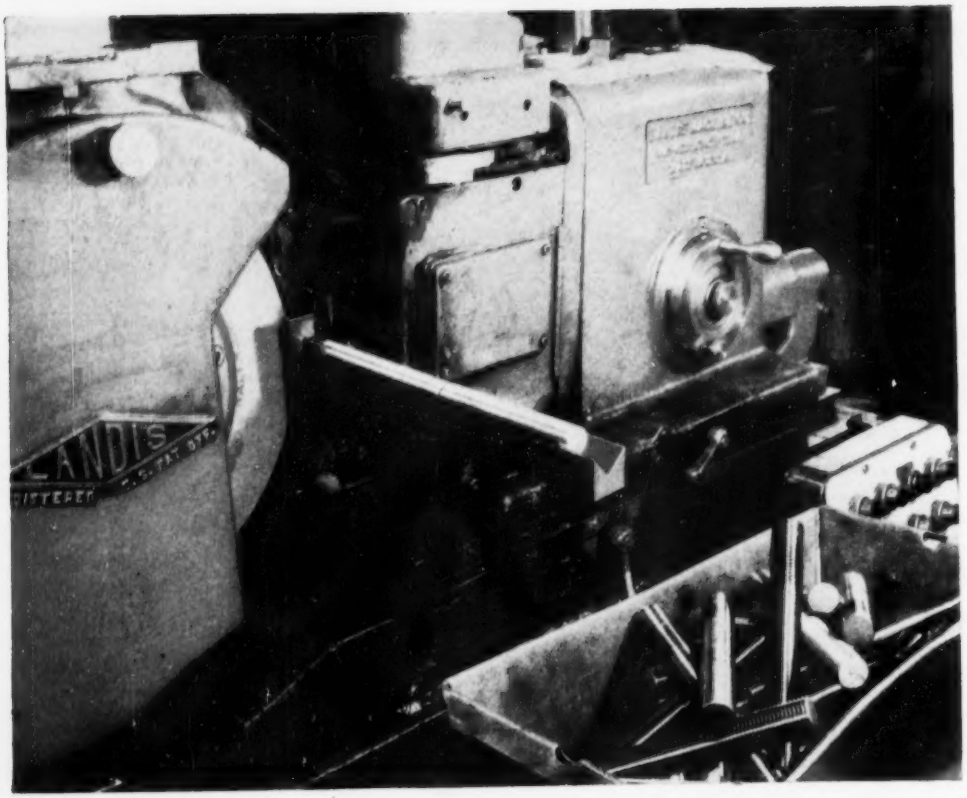
The DIVERSIMATIC Equipped for Crush Forming . . .

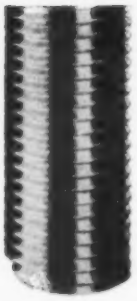
A NEW DEVELOPMENT THAT INCREASES THE SCOPE OF CENTERLESS GRINDING OPERATIONS

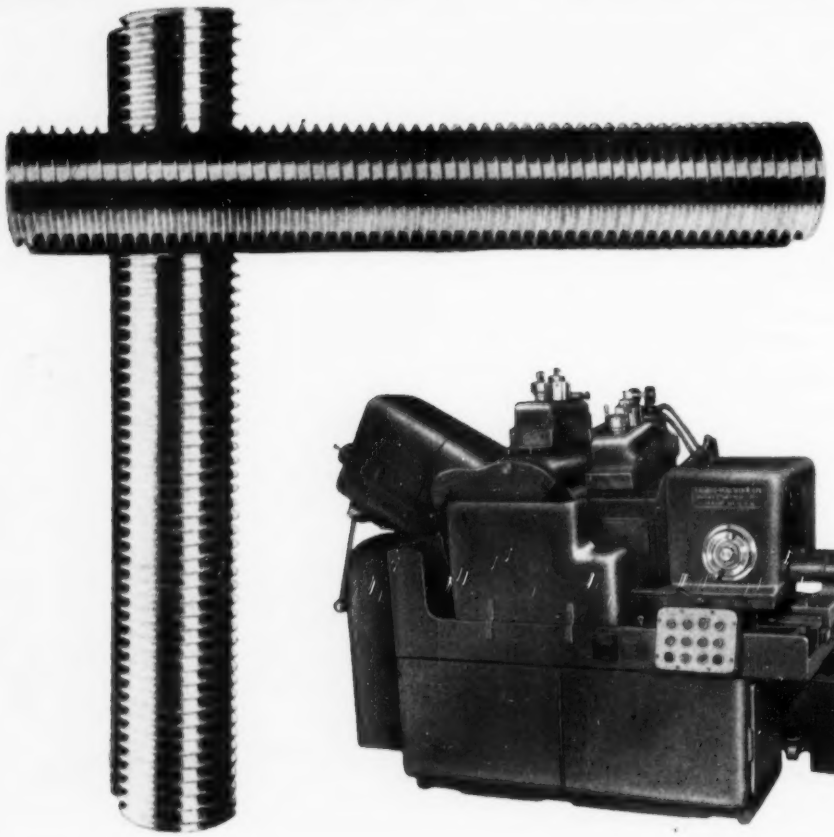
Now many small, formed parts and multi-diameters can be ground direct from the solid on the Diversimatic with the Crush Forming Attachment. It dresses the wheel to the desired contour and holds the form hundreds of pieces longer between wheel dressings, imparting the exact profile to the work. Also finish grinds rough-turned parts. Grinds faster, holds tolerances, cuts costs.

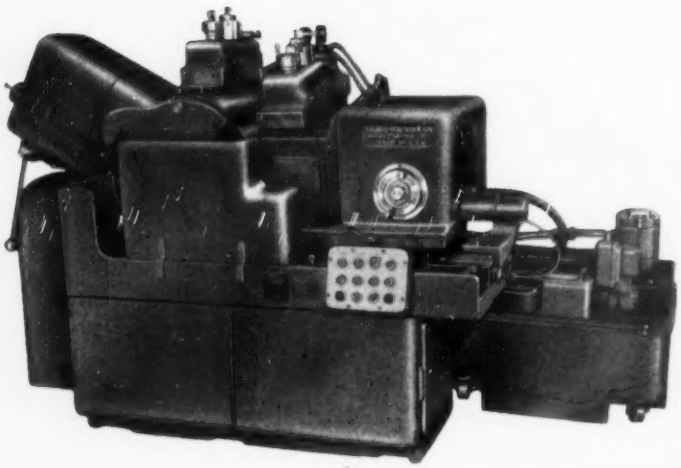
VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS, U.S.A.









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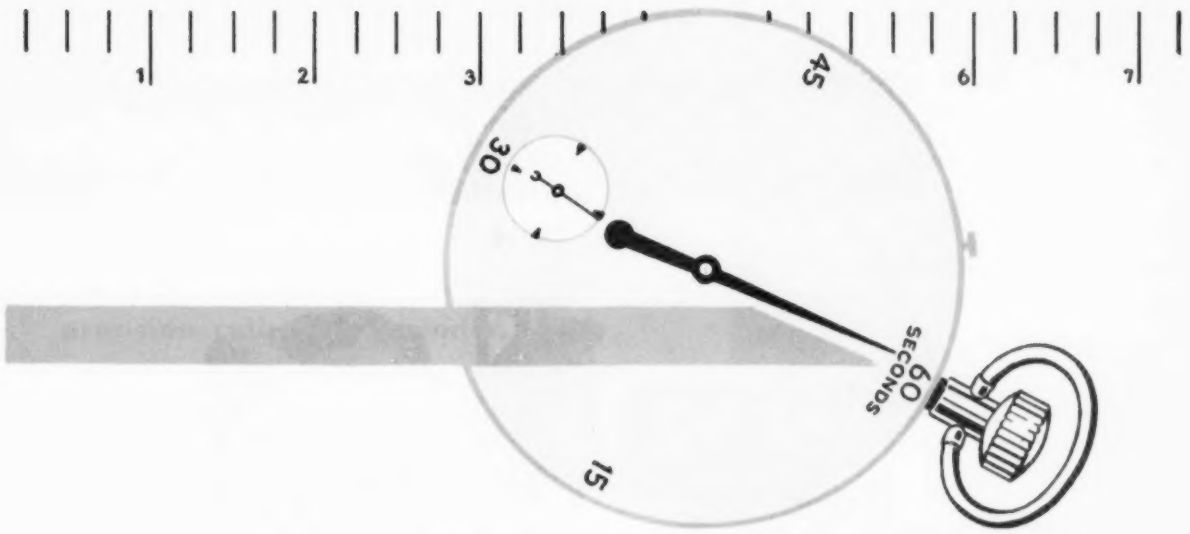


Threads 7¼" per Minute by CONTINUOUS GRINDING

LANDIS Centerless Thread Grinders are being used at the Kilbourn Engineering Company in Milwaukee, Wisconsin, to produce continuous threaded studs for high-pressure high-temperature service.

Studs ranging from ⅝" to 1⅜" in diameter are threaded from blanks of SAE 4140 steel heat-treated to a 260-320 Brinell hardness. In the operations illustrated, 1⅛" 8 pitch UN threads must be generated 10" long to a Class 7 fit to meet ASA standards (Manual B1.4). These threads are produced with LANDIS #1 Centerless Thread Grinders by continuous thru-feed grinding at the rate of 7¼ linear inches per minute, **or better.** The excellent quality and smooth finish of the ground thread has reduced final assembly time and minimized galling.

Centerless Thread Grinders, manufactured exclusively by LANDIS, are designed for the high-speed threading of a wide variety of workpieces from 1/16" to 4¾" in diameter. Blanks having one or more diameters, requiring threads on the outer diameter, can be threaded automatically by the thru-feed process used here.

Centerless Thread Grinding, by utilizing the "up-grinding" technique, is also well-adapted for threading workpieces of high hardness and coarse pitch. This process allows up to 30% higher work surface speeds, and often eliminates secondary threading passes required by other methods. For further information, send specifications and ask for Bulletin E-97.

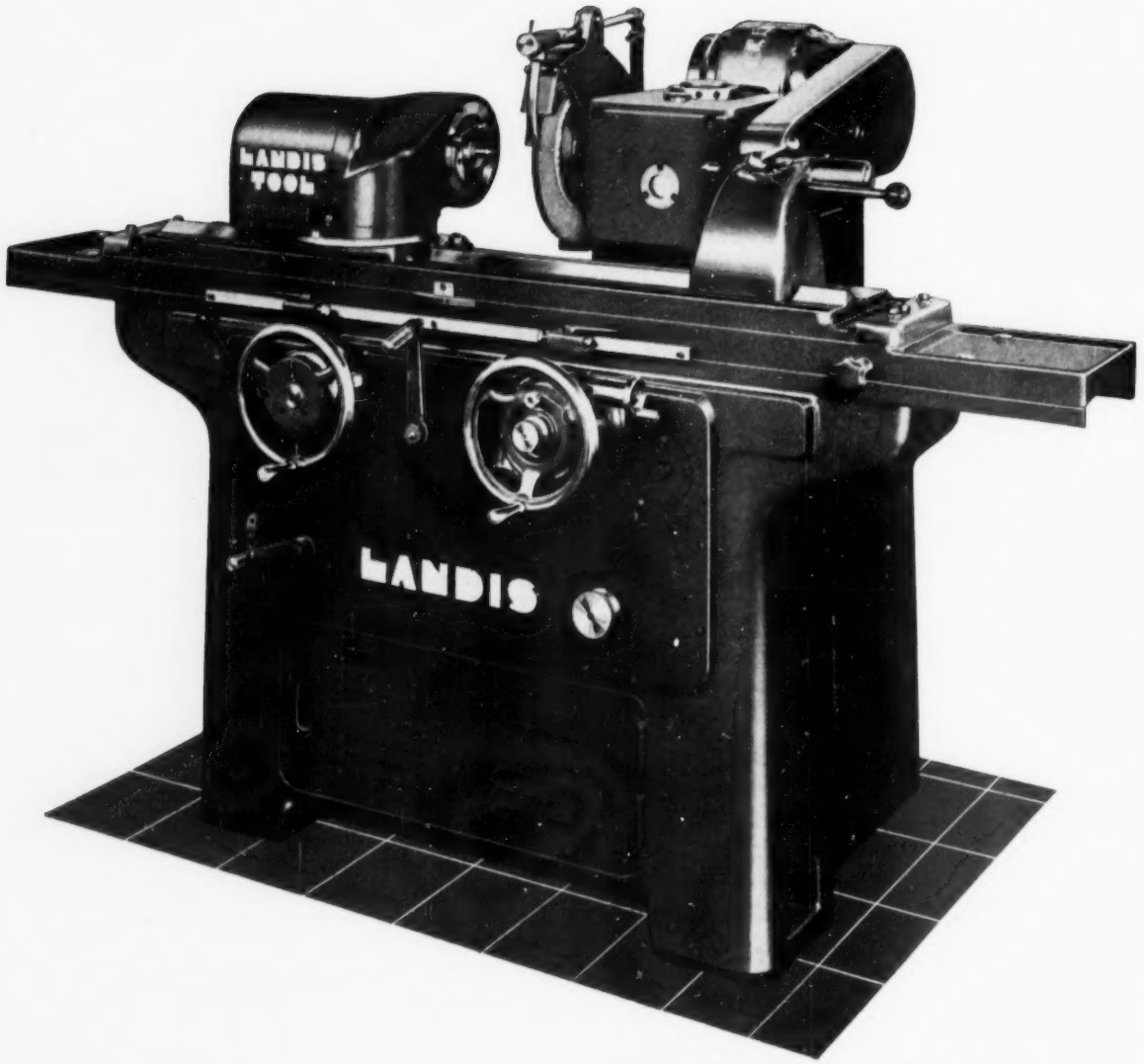
50TH ANNIVERSARY

LANDIS *Machine* CO. WAYNESBORO PENNSYLVANIA

THE WORLD'S LARGEST MANUFACTURERS OF THREAD GENERATING EQUIPMENT

Low Cost Precision Grinder

For General Purpose Grinding



LANDIS 12" x 28" Grindwell
for manufacturing, maintenance,
toolroom and training purposes.

LANDIS

precision grinders

Operations

LANDIS
12" x 28" Grindwell precision cylindrical grinder.

Look at these 10 money saving features for

Quick Set-up
Flexible Operation
Precision Grinding
Fine Finishes

1. Microsphere wheel spindle bearings
2. Variable infinite speed headstock
3. 12" swing—28" between centers
4. Live and dead spindle headstock
5. 12" diameter grinding wheel
6. Coolant pump and integral coolant reservoir
7. Two speed hand traverse
8. Precision coarse or fine wheel feed
9. Four speed power traverse
10. Swiveling headstock, wheel base and work table

for detailed information, specifications and extra equipment available, write for Bulletin S-49

LANDIS TOOL COMPANY
WAYNESBORO, PENNA., U.S.A.

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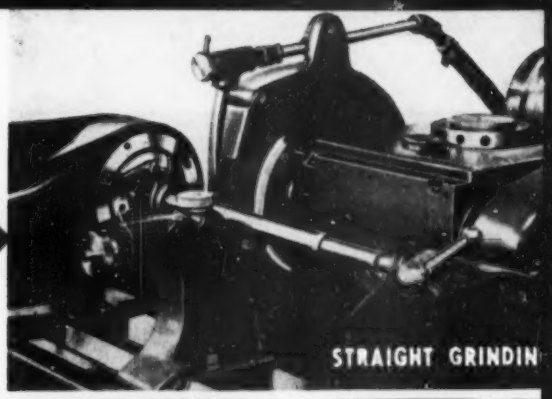
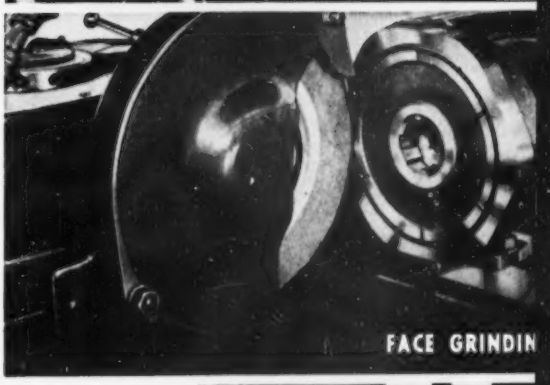
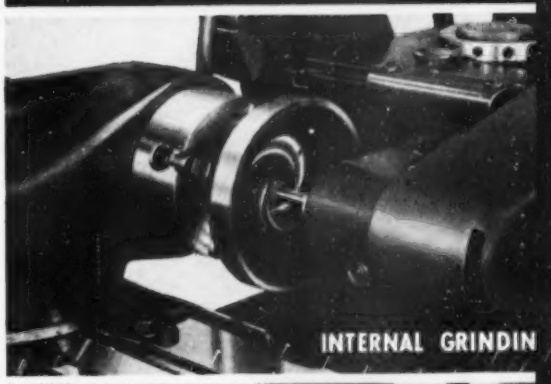


STRAIGHT GRINDIN

TAPER GRINDIN



FACE GRINDIN



INTERNAL GRINDIN

WHEEL BASE SET AT ANG

GIDDINGS&LEW
HYPRO

Photo courtesy of
TEMCO Aircraft Corporation
Dallas, Texas

Metal Surgeon...

with a flair for general practice

Performing with speed and precision this G & L Open Side Planer gives you a highly versatile tool to handle both common and uncommon work with equal efficiency

Productive flexibility . . . that's one of the many big advantages of using a G&L Planer such as this Hypro Open Side machine. Whether it's a simple or complex job . . . long or short run . . . big or small workpiece — this versatile machine completes it in minimum time with a minimum of setups.

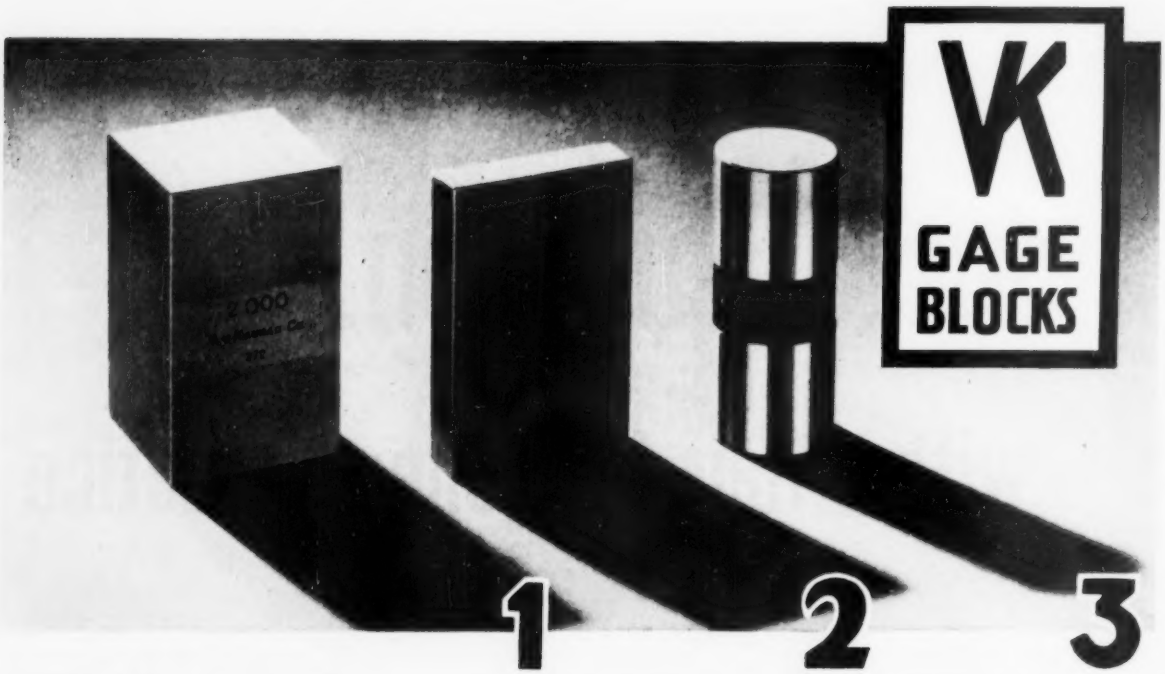
Its openside construction allows you to handle workpieces up to 120 inches in width. Table lengths can be furnished in the proper size you need, and horsepowers range up to 100. Smooth, responsive control minimizes tool breakage, and outstanding rigidity allows holding tolerances within ten-thousandths.

For complete information on the G&L line of Open Side or Double Housing Planers, see your representative or write —

GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty machine tools—Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Open Side Planers; Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools



THREE WAYS *to protect production accuracy*

To meet closest limits of accuracy and protect production, Van Keuren is currently furnishing three types of gage blocks:

1—SOLID SQUARE MASTER BLOCKS

2—RECTANGULAR REFERENCE GAGES

3—MICROGAGES

Shipment on complete sets of any of these three types can be made within 60 days from receipt of order.

VK Solid Square Master Blocks are accurate to .000004" per inch of length and are designed for laboratory use or to standardize all shop dimensions. Large wearing surface; perfect parallelism. Available in 85- and 41-block sets and guaranteed unconditionally for 5 years not to exceed .0001" in wear.

VK Rectangular Reference Gages are guaranteed accurate to .000008" per inch of length and are designed for the inspection department or precision set up work. They are available in 81-block and 33-block sets. Individual blocks from either of these sets can also be furnished. Certificate of size is also furnished with each set.

VK Microgages are accurate to plus .000012", minus .000008" per inch of length and are designed as working gages for shop use . . . to put accuracy at the machine. Wearing surface is 40% greater than that of rectangular gage blocks hence their long-wearing quality. Available in several set combinations.

Van Keuren Gage Blocks are fully described in Catalog and Handbook No. 35, yours for the asking by writing: The Van Keuren Co., 173 Waltham St., Watertown, Mass.

VK

34th YEAR

THE *Van Keuren* CO.

173 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires • Chrome Carbide Taper Insert Plug Gages.

Why your machinery and motors last longer with LINK-BELT Fluid Drive's constant

CUSHION ACTION

IF YOUR MACHINE loads are of the high inertia, repetitive shock or high starting torque type, Link-Belt's Fluid Drives can save you money.

Constant CUSHION ACTION gives you the shock absorption and overload protection you need. More—because shock load service factors can be disregarded, you can use power transmission equipment of lower horsepower.

Check the three curves below. They demonstrate three exclusive advantages of CUSHION ACTION. And for more detailed information, write for Book 2485. In it you'll find all the facts on five types of Link-Belt Fluid Drives —Electrofluid Drive, Electrofluid Gearmotor, Fluid Drive, Fluid Gear Drive and Fluid Coupling Drive.

Cutaway shows simple, rugged construction of Link-Belt Fluid Drive.

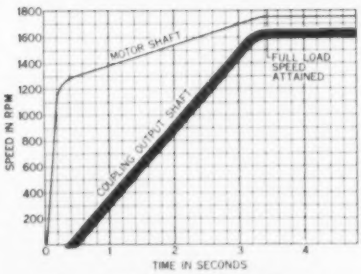
LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices, Factory Branch Stores and Distributors in Principal Cities.

LINK-BELT
FLUID DRIVES

12,854

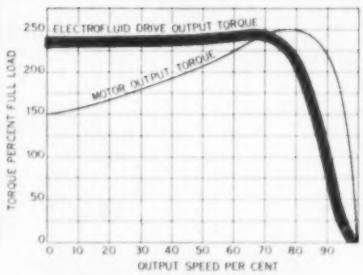
Here's proof—

that LINK-BELT CUSHION ACTION offers you real savings . . .



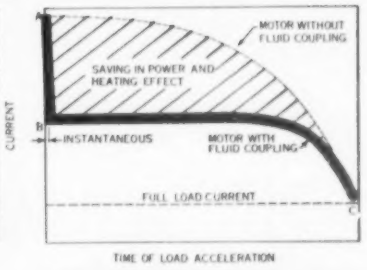
Smooth acceleration

Typical motor and coupling acceleration curves for a high-inertia load show how CUSHION ACTION smoothly and gradually accelerates the load, saving wear and tear on vital equipment.



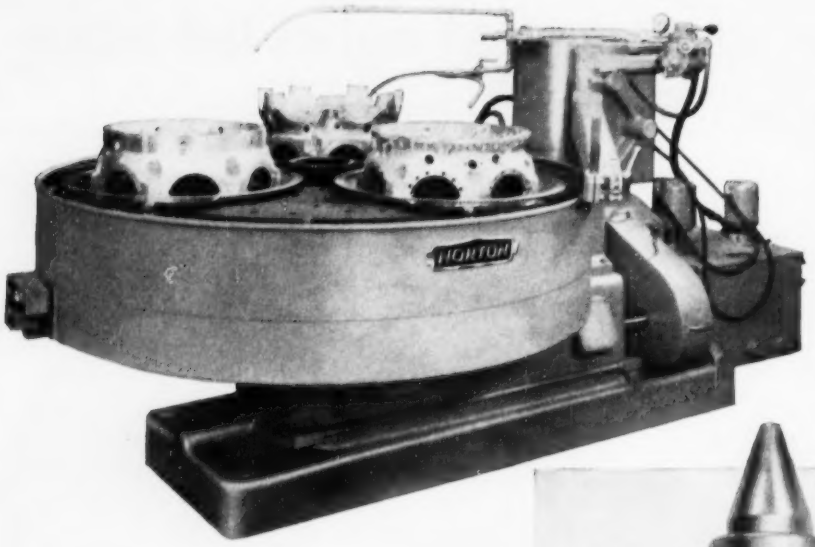
No overmotoring

Compare the output torque of a motor with and without the fluid coupling. Because motor accelerates free of load, it reaches maximum pull-out torque that might otherwise require a special type of oversize motor.

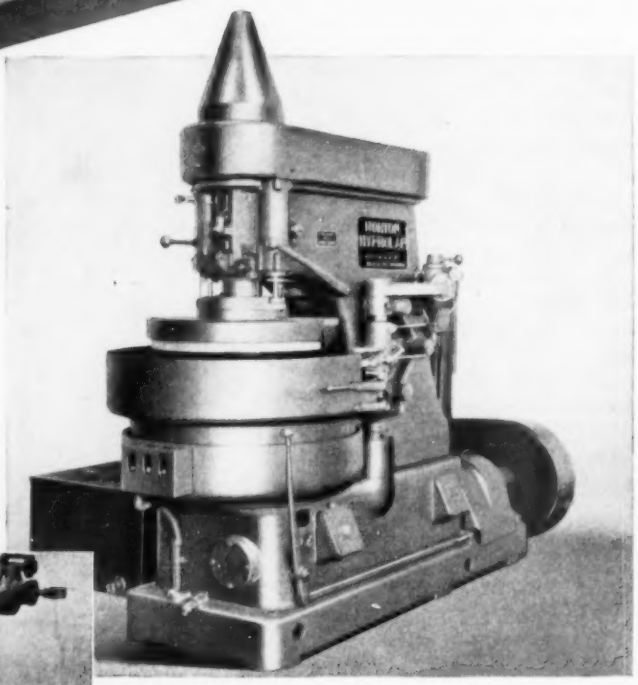


Low starting current

As these current consumption curves show, with the fluid coupling, motor starting current drops instantaneously to less than half the starting current required by a motor without fluid coupling. Difference represents power savings, reduced heating.

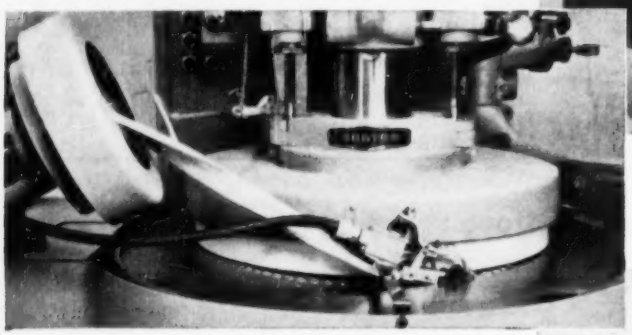


60″ single face flat lapping machine. Bonded abrasive laps make it a sensational performer, particularly on soft metals. It produces a clean finished surface free from imbedded grit. Provides seal surfaces, wear surfaces or flat surfaces for other machining operations. Hydraulic pressure device is available for light work; power-operated truing arm, loadless starting inertia-delay clutch. Capacity range, three 24″ pieces — one 60″ piece.



Hyprolap lapper No. 26. Extremely fast-cutting machine using bonded abrasive laps and filtered coolant. Finishes 20 or more work pieces simultaneously with a combination of accuracy and finish-uniformity otherwise unobtainable in mass production. Easy to operate. Lapping pressure is hydraulic powered and controlled — an exclusive Norton feature. Work capacity up to 3″ thickness or diameter, to 7½″ length.

Through-feed No. 26 Hyprolap machine. 4-to-1 savings proved on finishing small, flat parts. Handles small pieces up to 8,000 an hour. Loading and unloading are entirely automatic . . . less downtime for lap dressing because work path traverses the entire work surface of each lap. High worker skills are not needed. Work up to 1¼″ diameter. Modifications to handle larger work.



NEW!...NORTON JOB LAPPING SERVICE

Improve your product quality by precision lapping. The new enlarged Norton Job Lapping Department is ready to finish parts to your exact specifications. Complete and modern in every detail, the new department is manned by personnel skilled in every type of lapping process. Jobs handled include flatwork up to 24″ across and cylindrical work from ⅛″ diameter by ½″ long to 2″ diameter by 8″ long, in practically every material. The best type of lapping for your requirements — with rapid stock removal and highest precision finishes — can be produced. See your Norton Representative for details, or write us direct.

Vertical lapping machine type 16FC has outstanding production capacity in such work as diesel injector parts, plug gages, size blocks, the sides of rings, and rollers. It produces flat or cylindrical work to a high degree of dimensional accuracy, parallelism and finish. Work capacity: 3" x 5" flat and 3" diameter cylindrical.

LAPPING MACHINES THAT GIVE YOU THE

"TOUCH OF GOLD"

Here they are. Six great lapping machines by Norton. Each designed for single or multi-purpose — but all built to give you the "Touch of Gold."

Every second of operation, value is being added to the product through a finer, smoother, precise finish achieved in less time. This adds to your profit margin and to the ultimate user's satisfaction.

Whatever your needs there is the right Norton Lapping Machine to give you maximum output, minimum downtime; higher quality work and less dependence on manual skills.

Send for more complete information or submit samples of your work for correct lapping machine application and production. NORTON COMPANY, Worcester 6, Mass.

***To Economize, Modernize With* NEW**

NORTON

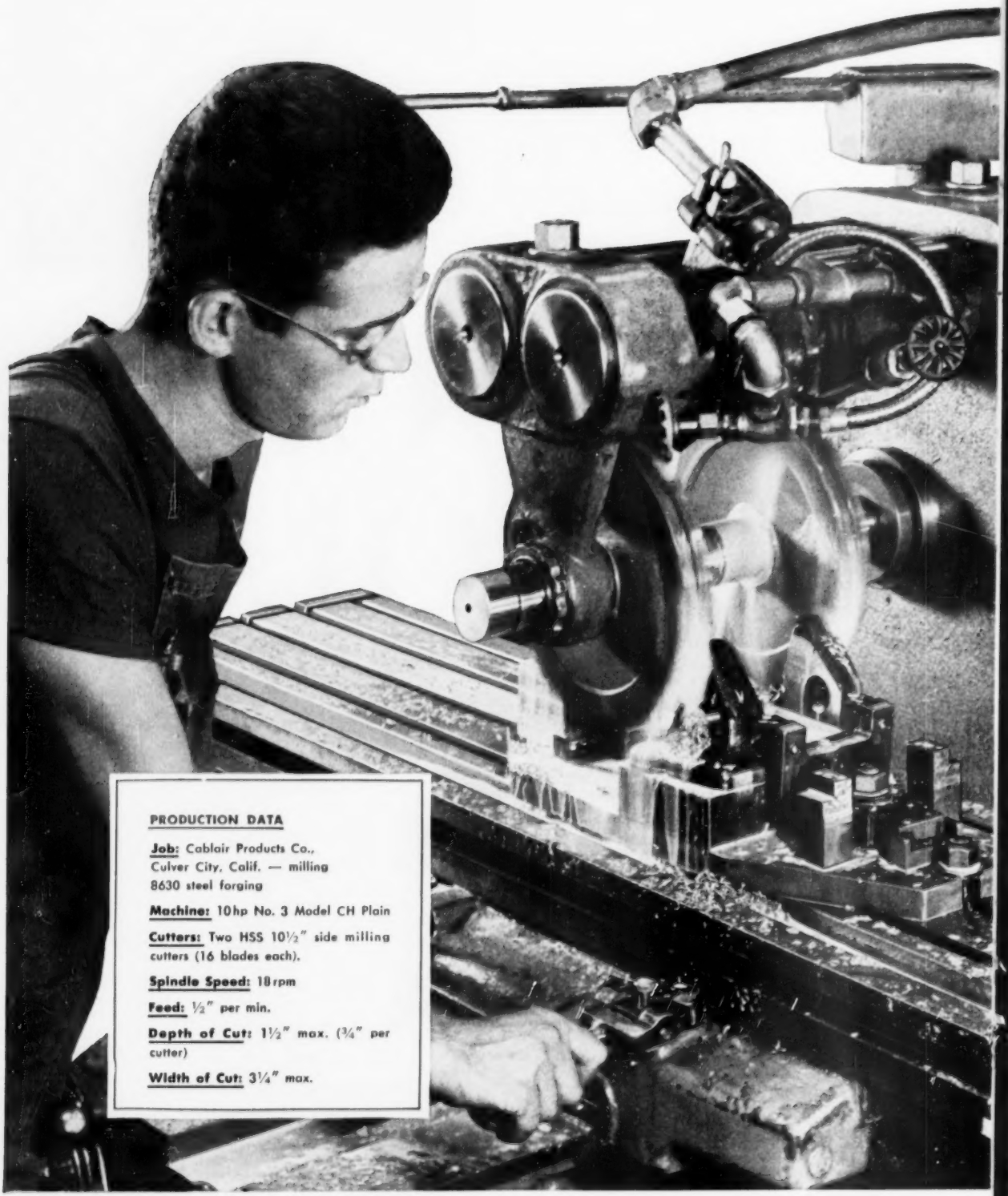
GRINDERS *and* LAPPERS

Making better products . . . to make other products better

District Sales Offices: Hartford • New York • Cleveland • Chicago • Detroit
In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5

Simplex surface finisher No. 12. A highly efficient machine which uses flexible coated abrasives. Ideal for handling small crankshafts for refrigerator compressors and outboard motors, eccentric and concentric cylindrical surfaces, journals and seal surfaces on many cylindrical parts. Work capacity: ½" to 2½" diameter; up to 12" length.

Getting right speed



PRODUCTION DATA

Job: Cablair Products Co., Culver City, Calif. — milling 8630 steel forging

Machine: 10hp No. 3 Model CH Plain

Cutters: Two HSS 10½" side milling cutters (16 blades each).

Spindle Speed: 18rpm

Feed: ½" per min.

Depth of Cut: 1½" max. (¾" per cutter)

Width of Cut: 3¼" max.

selection for tough forgings—

no problem with a CH machine!

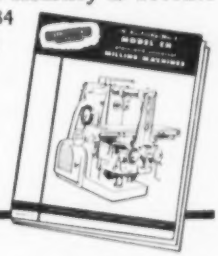
● This Kearney & Trecker No. 3CH 10 hp Milling Machine mills 100 steel forgings between cutter grinds. Previous average was only 18 pieces!

Milling tough steel forgings might have presented a difficult production problem if this manufacturer had not owned a versatile No. 3CH miller. Tough material, the necessary speeds and size of cut combined to produce excessive cutter wear. An average of only 18 pieces could be machined before cutters had to be reground. This situation, unremedied, would have seriously restricted output and increased costs.

However, the CH miller's design provides a wide range of 24 spindle speeds (15 to 1500 rpm). By utilizing this feature, and selecting an appropriate coolant, the manufacturer *increased cutter life by over 500%!* Today, uninterrupted runs of 100 pieces are average.

This case is only one of hundreds where CH design features provide the versatility to easily meet common as well as unusual machining problems.

For details on Kearney & Trecker CH machines, contact your representative or write to Kearney & Trecker Corporation, 6784 West National Ave., Milwaukee 14, Wis., for illustrated brochure.



Check these important CH features

Extra wide feed range — 32 changes from 3/8" to 90" per minute meet requirements of new metals and cutting tools.

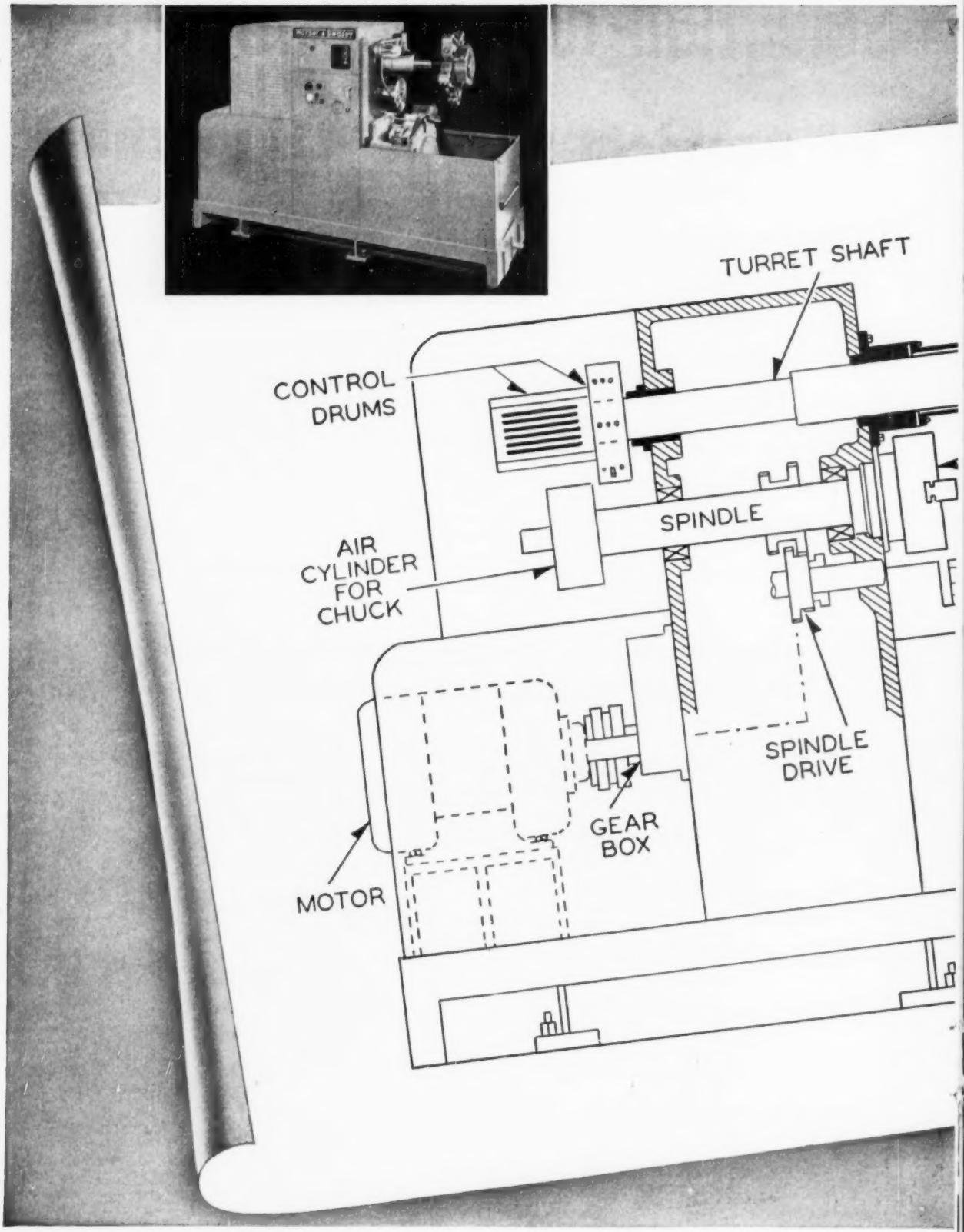
Greater rigidity — entirely new column . . . heavily ribbed, box section, sponson construction . . . absorbs vibration from heaviest cutting loads.

Smoother feed performance through a heavy duty 2" dia. table feed screw. Extra large bronze nut provides greater bearing contact for longer screw life and backlash elimination.

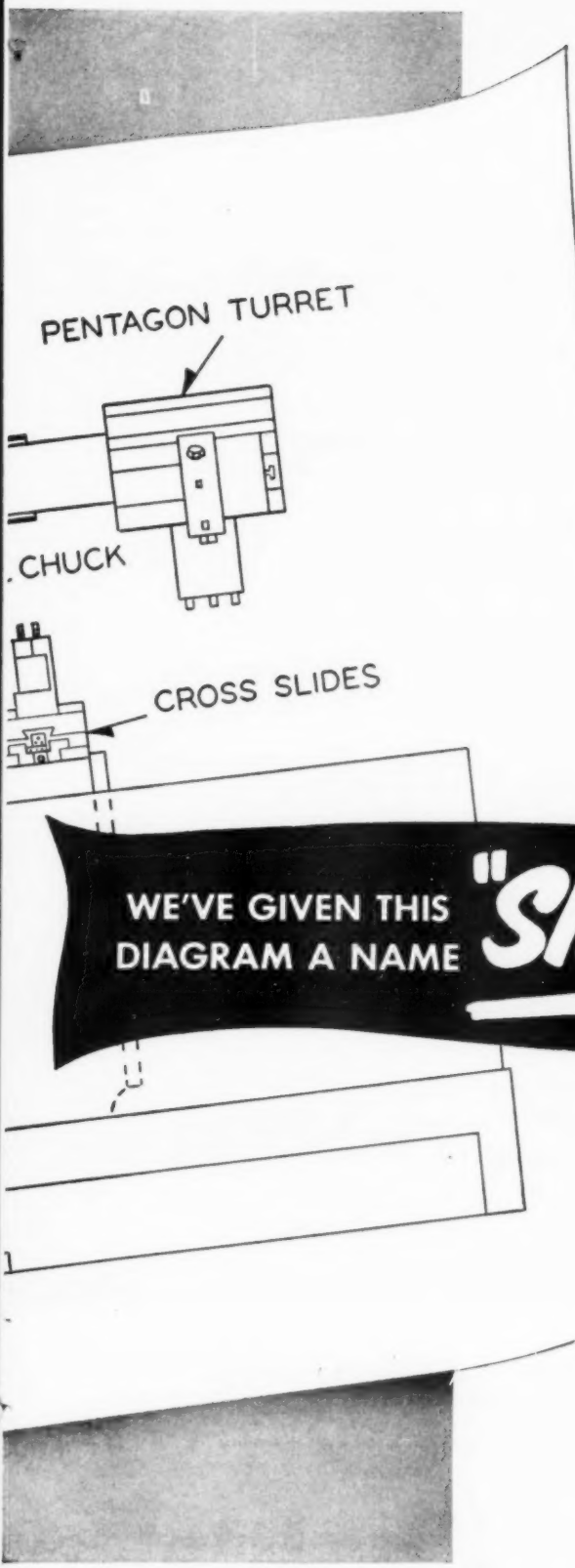
Greater horsepower through independent drives for spindle, feed and rapid traverse, and coolant. 10 hp delivered to spindle . . . 3 hp for feed and rapid traverse . . . 1/4 hp for coolant.

Kearney & Trecker 10 hp No. 3CH Milling Machine.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS



YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY



WE'VE GIVEN THIS DIAGRAM A NAME "SIMPLICITY!"

● We've labeled it "simplicity" because the machine it represents *is* so simple. Engineered simplicity is designed into the Warner & Swasey 1AC Single Spindle Automatic Chucking Machine.

The 1AC is simple and easy to set up . . . simple to tool, and simple to operate. There are no cams to change, and tooling stations are easy to get at. A wide range of speeds and feeds are readily available.

You get accurate, automatic machine operation on even small lot jobs that were never practical for automatic machines before.

Certain machining jobs in your plant —even in small or medium lot runs— can undoubtedly be done faster, and with less manpower, with the 1AC Automatic. To find out how this 1AC fits into your production picture, call our Field Representative in your territory.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

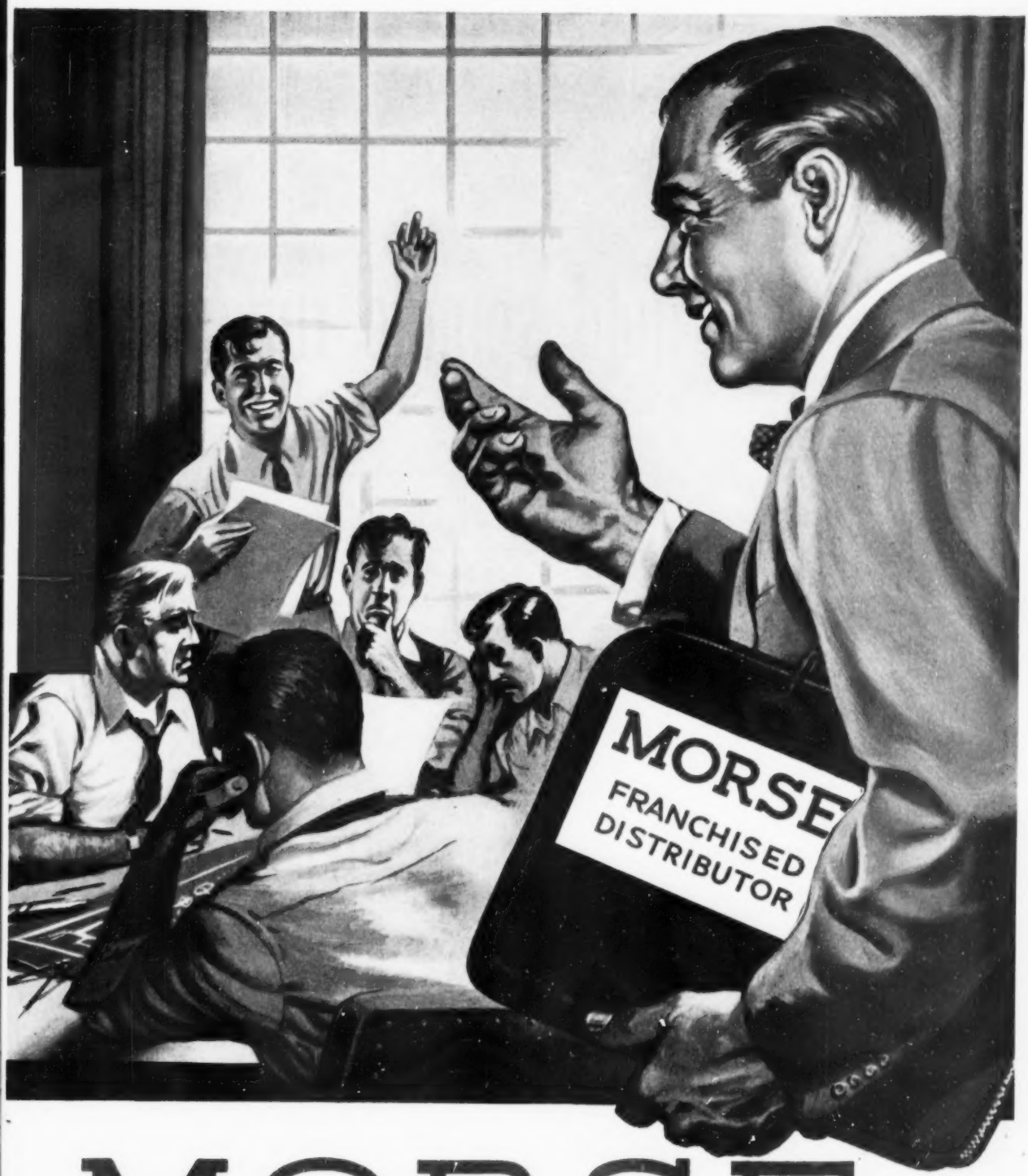
MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

Are You making full use of your "friend in time of need?"

He's no "fair-weather friend"— your Morse-Franchised Distributor. He's your *first aid* in time of trouble, when time's a-wasting. Whatever you need in Morse Cutting Tools, he's got it or can get it on the jump. And he knows his book on engineering these tools to your job. Yes, he's right on the spot to save you production time . . . not to mention purchasing and bookkeeping time, too.

So always call your Morse-Franchised Distributor for the best service on the best cutting tools made. Remember . . . *when he walks in the door, trouble flies out the window.*

MORSE TWIST DRILL & MACHINE COMPANY
NEW BEDFORD, MASSACHUSETTS
(Division of VAN NORMAN CO.)
Warehouses in New York, Chicago, Detroit, Houston, San Francisco



MORSE

Cutting Tools

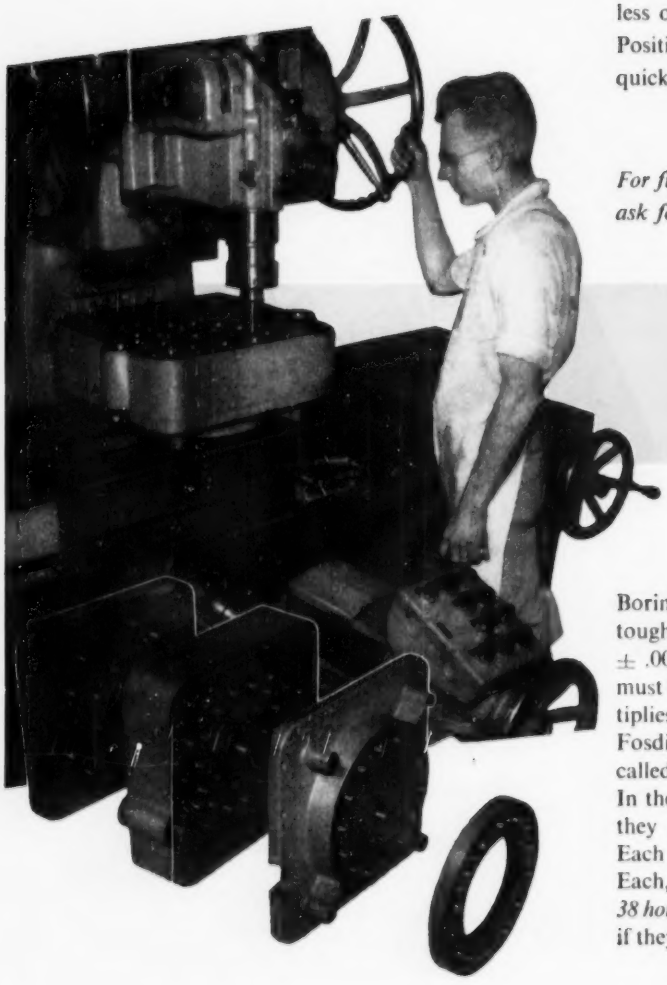
Buy them by phone from your Morse-Franchised Distributor and save ordering time

Here's another reason it pays to get a proposal from Fosdick

We hold spindle runout to

Less than .0002" runout at the end of a 12" proving bar! That's one of *many* rigorous tests every Fosdick Jig Borer must pass before it leaves our shop. These tests are your assurance, and ours, that you will get true precision . . . as good as *or better than* any Jig Borer will deliver—regardless of price! This machine is available with Automatic Positioning which enables you to locate holes to ± .0001", quickly and without need for highly-skilled operators.

For full description of the Fosdick Jig Borer, ask for Bulletin JB-A.



to give you

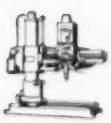
Precision Drill Head Boring Speeded by Automatic Positioning

Boring this four-piece 28-spindle drill head housing is a tough job in any man's shop. All bores have to be held to ± .0002". Further, all back boring on spindle locations must be within .0001" for alignment because any error multiplies 5 times or more at the drill point. For jobs like this, Fosdick's Proposal to the R. & B. Tool Co. of Saline, Mich., called for a 42-P Jig Borer with Automatic Positioning. In the first four weeks after R. & B. received the machine, they completed seven sets of the housing illustrated. Each included 139 holes charted, roughed and finish bored. Each, with a total of 528 machine positions, *required only 38 hours to complete.* Ten hours less, R. & B. estimates, than if they'd used a machine without automatic positioning!

.0002"

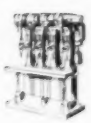
precision boring like this

Need Drilling Equipment? Get a Proposal from Fosdick!



Radial Drills

Jig Borers



Sensitive and Upright Drills

Sensitive Radial Drills

Automatic Positioning Machines

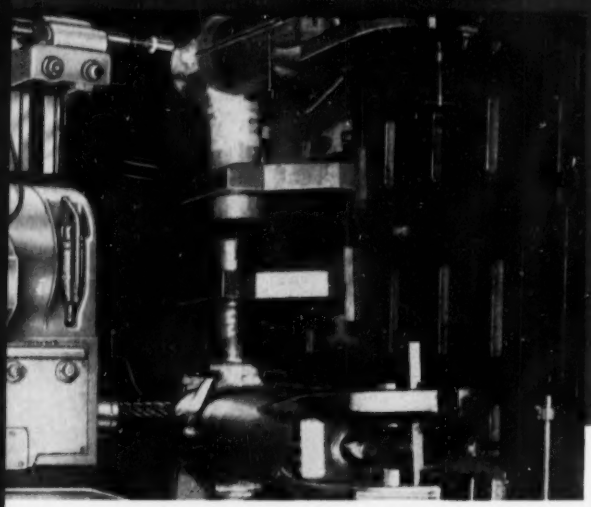
FOSDICK

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

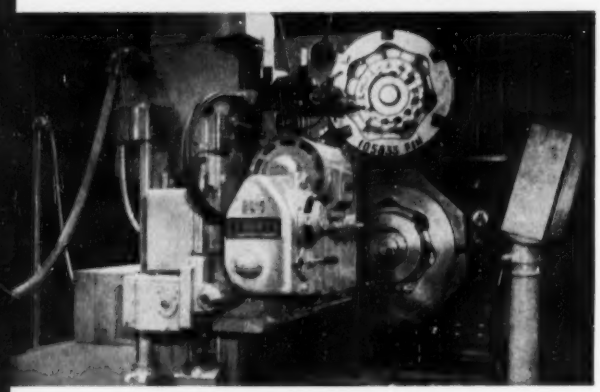
BEST WAY TO MACHINE COMPLEX, IRREGULAR SHAPES

is with a

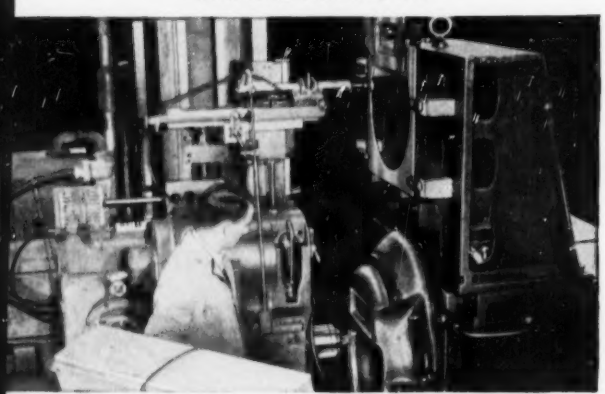
PRATT & WHITNEY KELLER MACHINE



EXPERIMENTAL AIRCRAFT PART



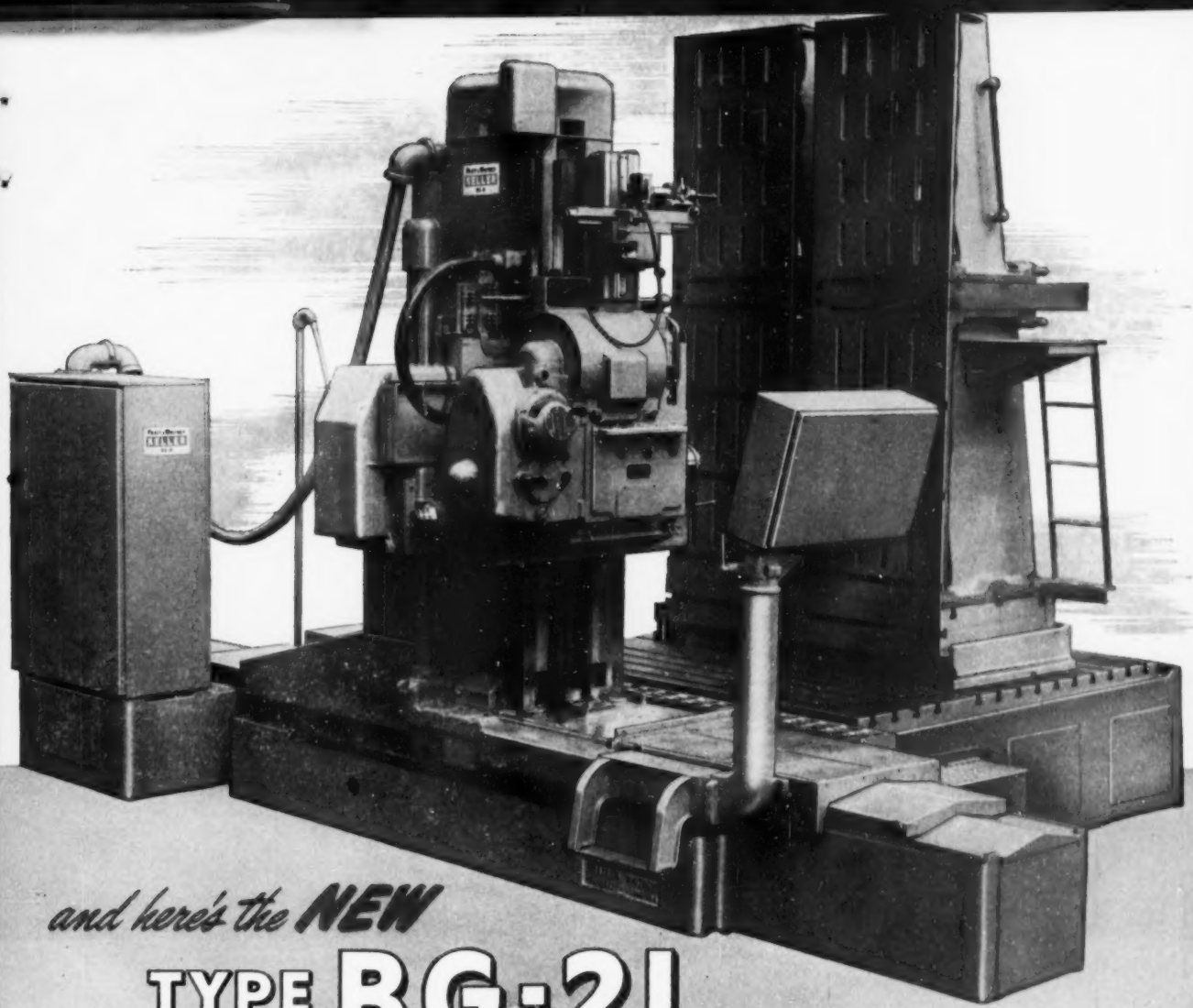
INTRICATE FORGING DIE



PRODUCTION CONTOUR MILLING

Ideal for FORGING, STAMPING OR DIE-CASTING DIES — PLASTIC, RUBBER OR GLASS MOLDS — METAL PATTERNS — PROTOTYPE OR EXPERIMENTAL PIECES — OR PRODUCTION PARTS

- **MAKES HARD JOBS EASY** . . . handles irregular shapes and complex geometrical curves that cannot be machined conveniently or economically by other methods.
- **DESIGNED AND BUILT SPECIFICALLY FOR TRACER-CONTROLLED MILLING** . . . not just "adapted." Ready to take on an almost unlimited variety of jobs without major adaptation by expensive attachments.
- **RUGGED, DEPENDABLE, STAYS-ON-THE-JOB** . . . year after year without frequent or expensive maintenance.
- **P&W BUILT-IN ELECTRIC TRACER CONTROL** . . . provides instant changeover from two-dimensional (profiling) to three-dimensional operation or vice versa . . . duplicates templates or full models exactly without compensation.
- **P&W HORIZONTAL CONSTRUCTION provides GREATER STRENGTH, RIGIDITY, EFFICIENCY and CONVENIENCE** . . . by moving the machine elements of constant-weight and holding stationary the workpieces of variable-weight, more uniform cutting action is obtained.



and here's the **NEW**

TYPE BG-21

TWO STANDARD SIZES
5 feet x 2½ feet
6 feet x 4 feet

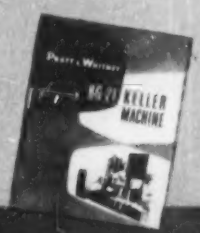
SINGLE AND TWO-SPINDLE MODELS Patterned after the famous giant Keller Type BG-22 but smaller in overall size and capacity, the new Type BG-21 P&W Keller Machine is an entirely new design and incorporates many important new features.

FEATURES

- **CENTRALIZED "PUSH BUTTON" CONTROL** . . . with all machine motions operated by push buttons or switches centralized on a single, conveniently located panel.
- **SIMPLIFIED LUBRICATION** . . . by a one-shot system actuated by a single pump at the operator's station. Insures quick, positive, thorough lubrication of all sliding surfaces.
- **NON-SCORING WAYS** . . . because phenolic-to-metal bearing surfaces are used throughout, (including feed-screw nuts) and telescoping guards are provided to protect the horizontal ways. Operation is smooth, wear is minimized, and original high accuracy is maintained indefinitely.
- **AUTOMATIC CHIP DISPOSAL** . . . screw conveyor type . . . eliminates stopping production to clear away chips.

For Complete Information
Write on your Company letterhead for your free copy of the new BG-21 Circular No. 565.

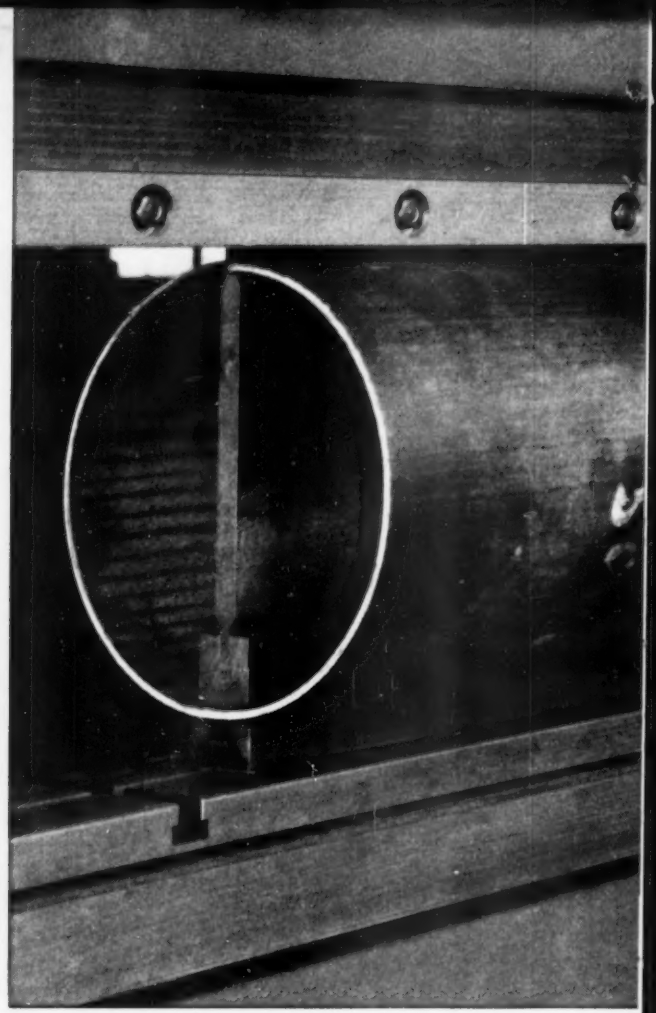
PRATT & WHITNEY
DIVISION NILES BEMENT-POND COMPANY
WEST HARTFORD 1, CONNECTICUT, U. S. A.



First Choice P&W *for Accuracy*

MACHINE TOOLS • CUTTING TOOLS • GAGES

pipes ...tubes ...posts

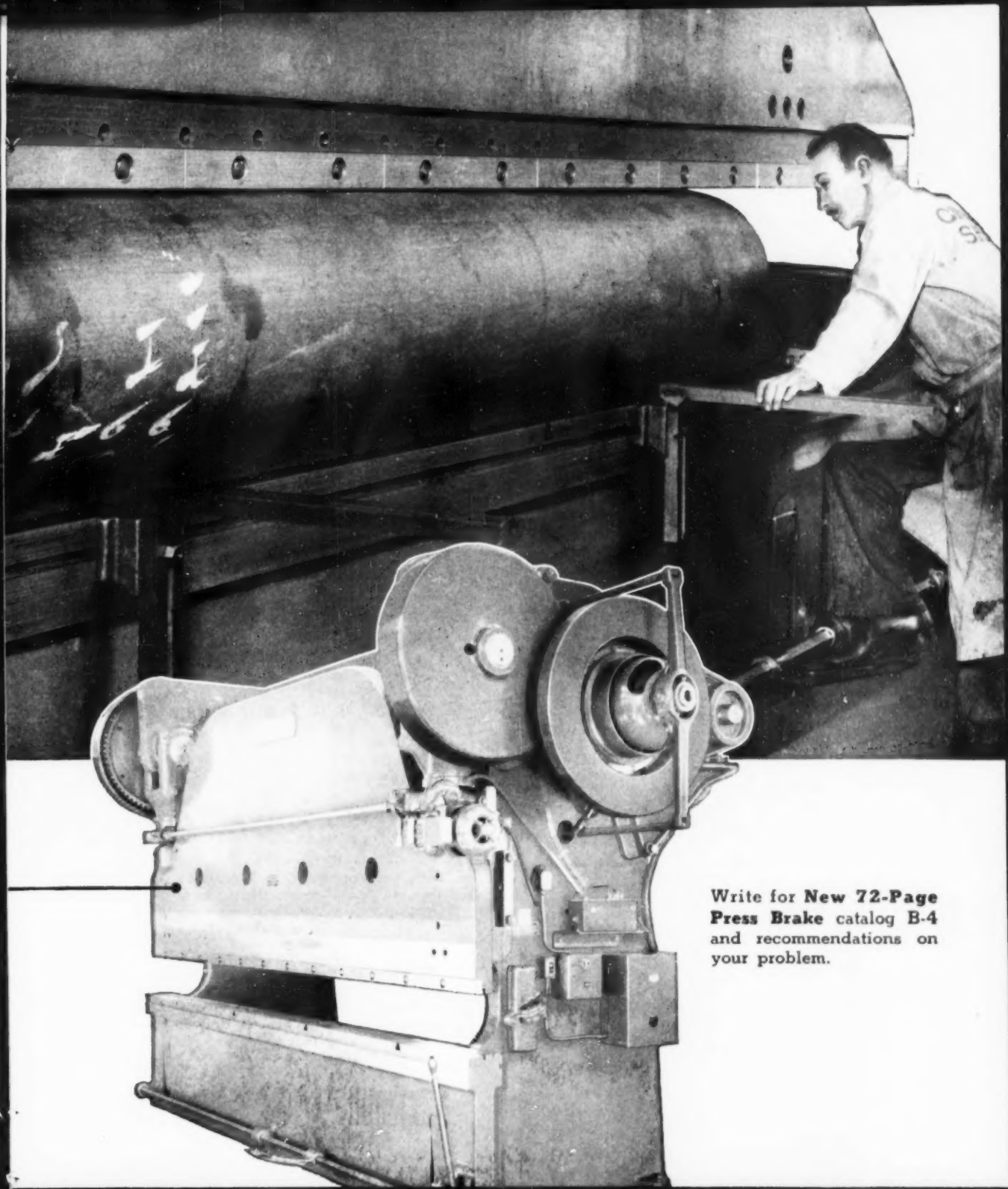


...ACCURATELY and EASILY formed on

Cincinnati Press Brakes

Large diameter pipes and tubes can be completely formed on versatile Cincinnati Press Brakes. Round, tapered lamp posts up to 30 feet long are also formed by prekinking the edges and then completing the tapered tube in several additional hits on taper dies.

Cincinnati Press Brakes also crimp sheet and plate before rolling to eliminate flats at the seam edges.

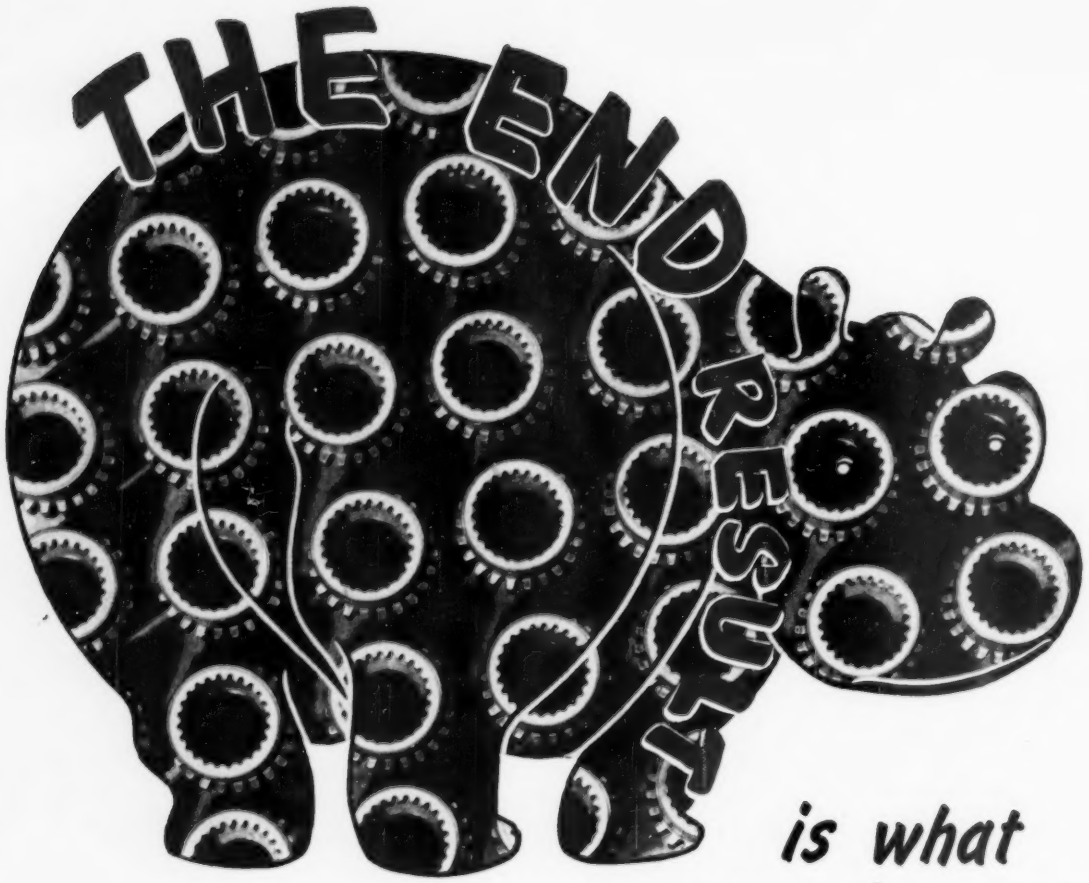


Write for **New 72-Page Press Brake** catalog B-4 and recommendations on your problem.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

CINCINNATI



is what counts when you buy small gears

Extra years of smooth, quiet, *dependable* performance is *"the end result"* when you buy G. S. Small Gearing. Added to these superior advantages is the joy of getting Gears that measure up to highest UNIFORM quality standards, *always!* No more costly downtime caused by excessive rejects that clog assembly lines . . and, no more customer complaints. Call us early . . at the drawing board stage . . whenever Fractional Horsepower Gearing is involved. Get all the benefits only 35 years of specialization can give.

GET OUR *Free* 6-PAGE FOLDER

See where and how we mass-manufacture Small Gearing to uniformly fine tolerances. This attractively printed 8-½ x 11" 6-page folder is punched for ring-binder use. You'll want to keep it handy for frequent reference. It contains 23 pictures of Small Gears, plant views, as well as Diametral and Circular Pitch Tables. Ask for your copy on company stationery, please!

FRACTIONAL HORSEPOWER GEARING

GS

GEAR

Specialties, Inc.

2635 WEST MEDILL AVENUE
CHICAGO 47, ILLINOIS

SPURS • SPIRALS • HELICALS • BEVELS • INTERNALS
WORM GEARING • RACKS • THREAD GRINDING

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARING

Ask your Distributor

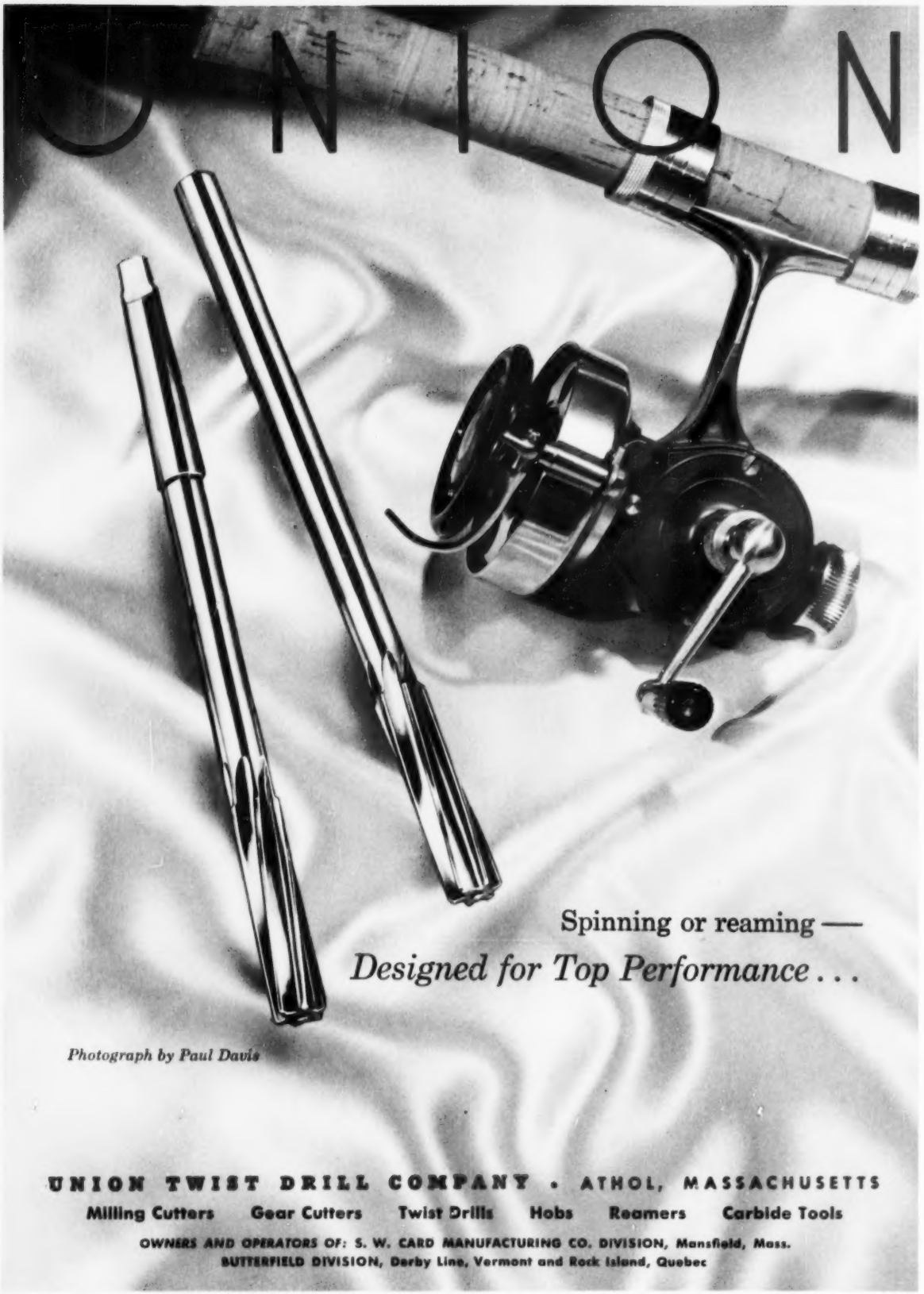
Photograph by Paul Davis

Part of Butterfield's fine reputation for taps and dies stems from rigid control over quality production. The value shows up in performance.

B U T T E R F I E L D

Union Twist Drill Company ***Butterfield Division*** *Derby Line, Vermont, U. S. A.*

TAPS • DIES • REAMERS • DRILLS • COUNTERBORES • SCREW PLATES



Spinning or reaming —

Designed for Top Performance . . .

Photograph by Paul Davis

UNION TWIST DRILL COMPANY • ATHOL, MASSACHUSETTS

Milling Cutters Gear Cutters Twist Drills Hobs Reamers Carbide Tools

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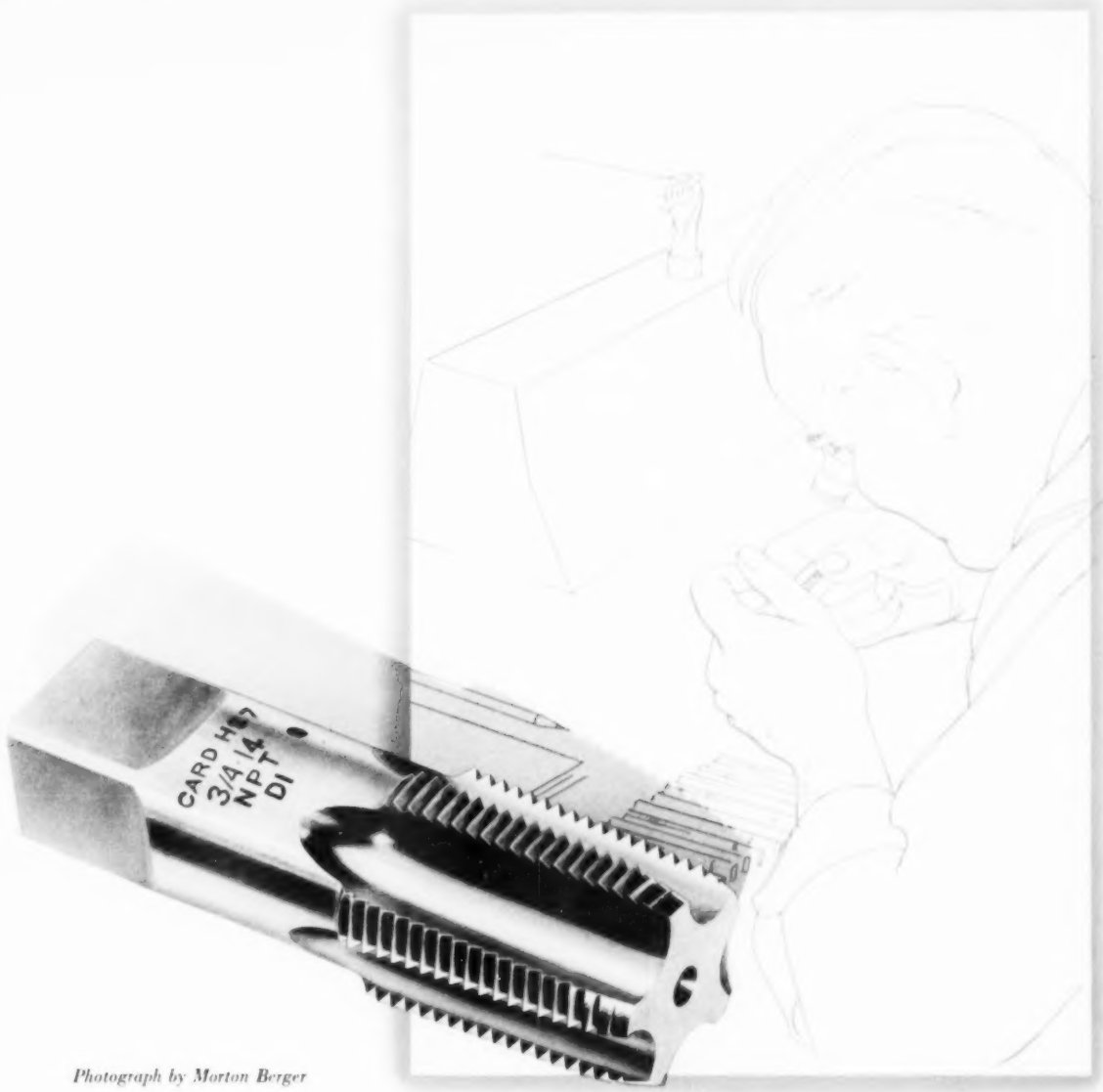

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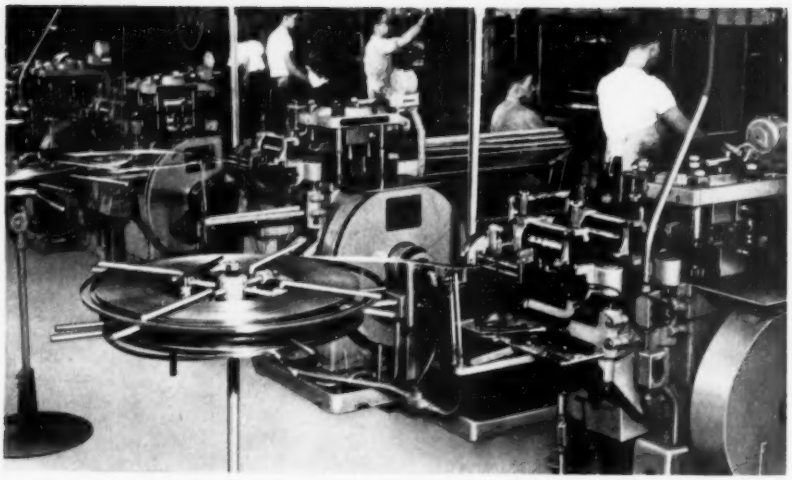

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GIVE BARBER-COLMAN UP TO 470 PIECES A MINUTE

DOUBLE DIE SET UP is used whenever possible by Barber-Colman Company to take full advantage of the high speed and accuracy of Henry & Wright Dieing Machines. Twin dies enable the 25-tonners, when operated at 235 strokes a minute, to stamp out 470 pieces a minute.

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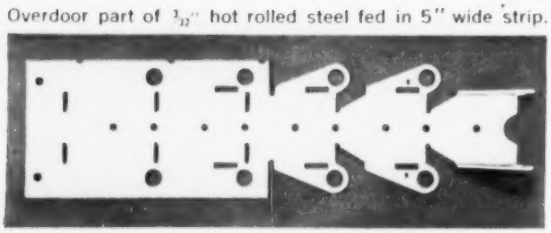
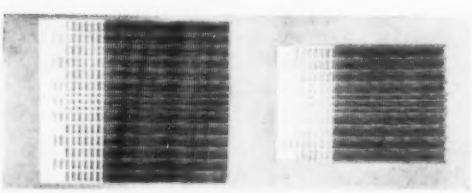
1953 CATALOG AVAILABLE — Eye-opening facts about Henry & Wright Dieing Machines. Write for your copy to Henry & Wright, 481 Windsor St., Hartford, Connecticut.

Overdoor part of $\frac{1}{32}$" hot rolled steel fed in 5" wide strip.





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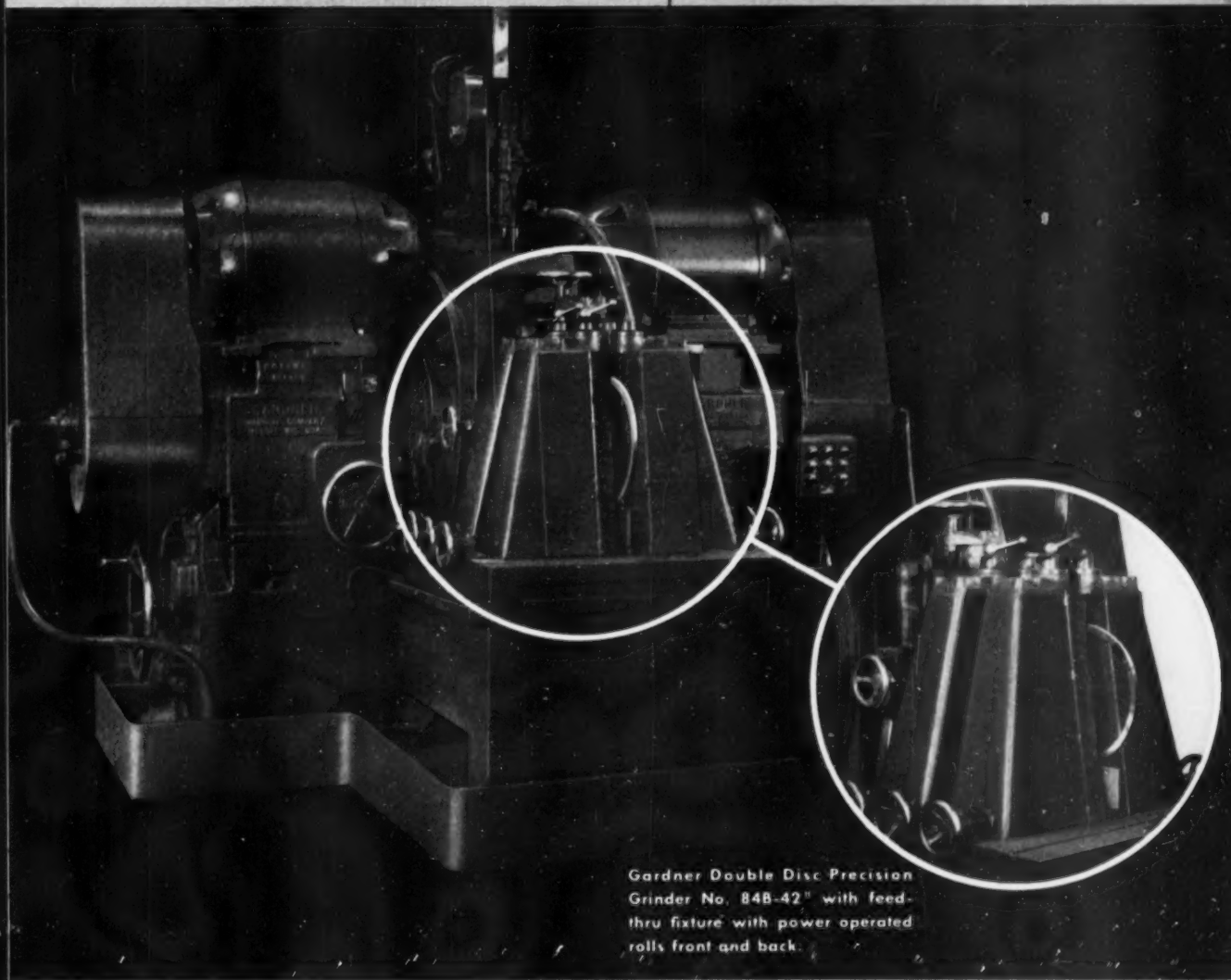

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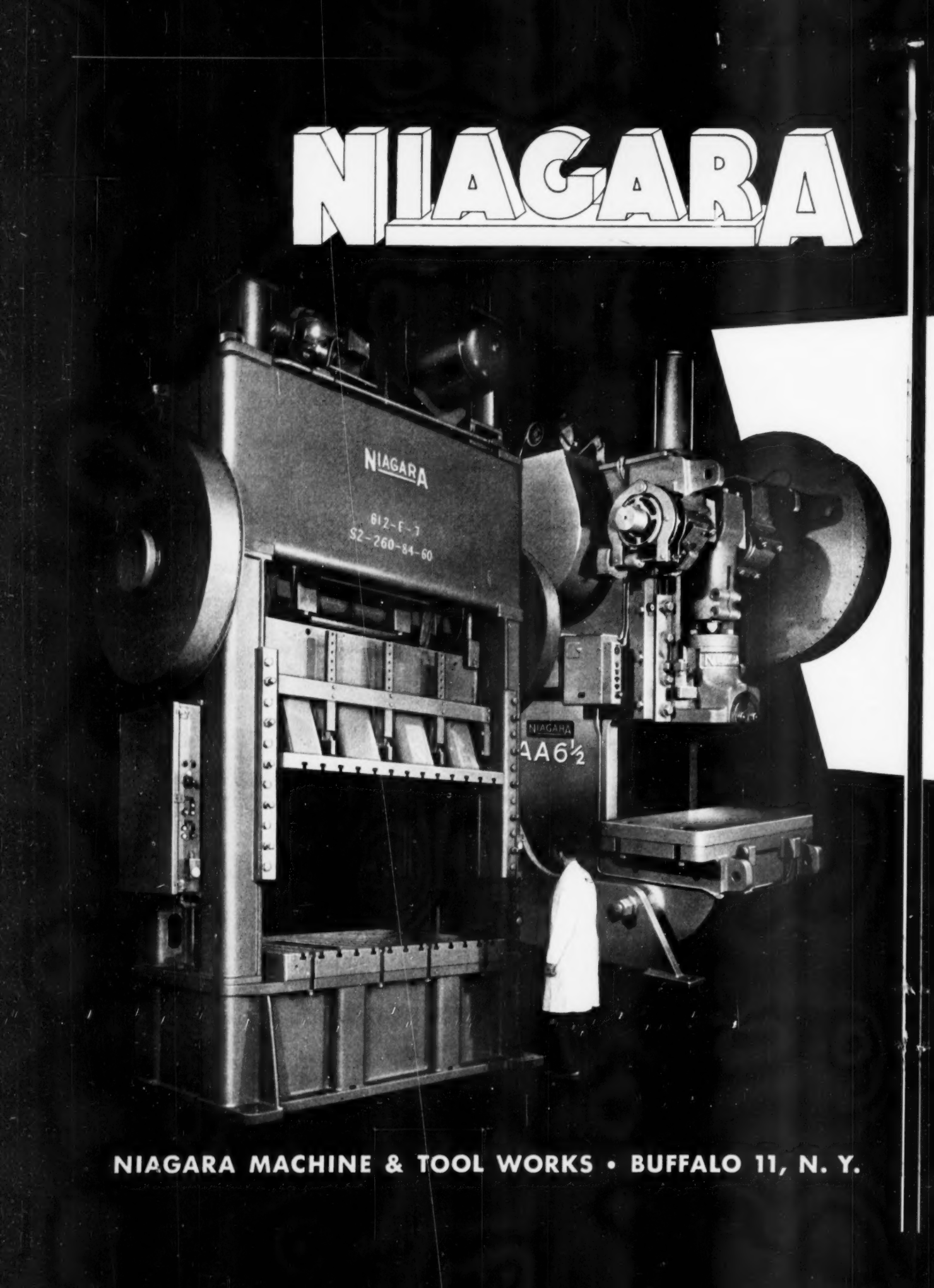

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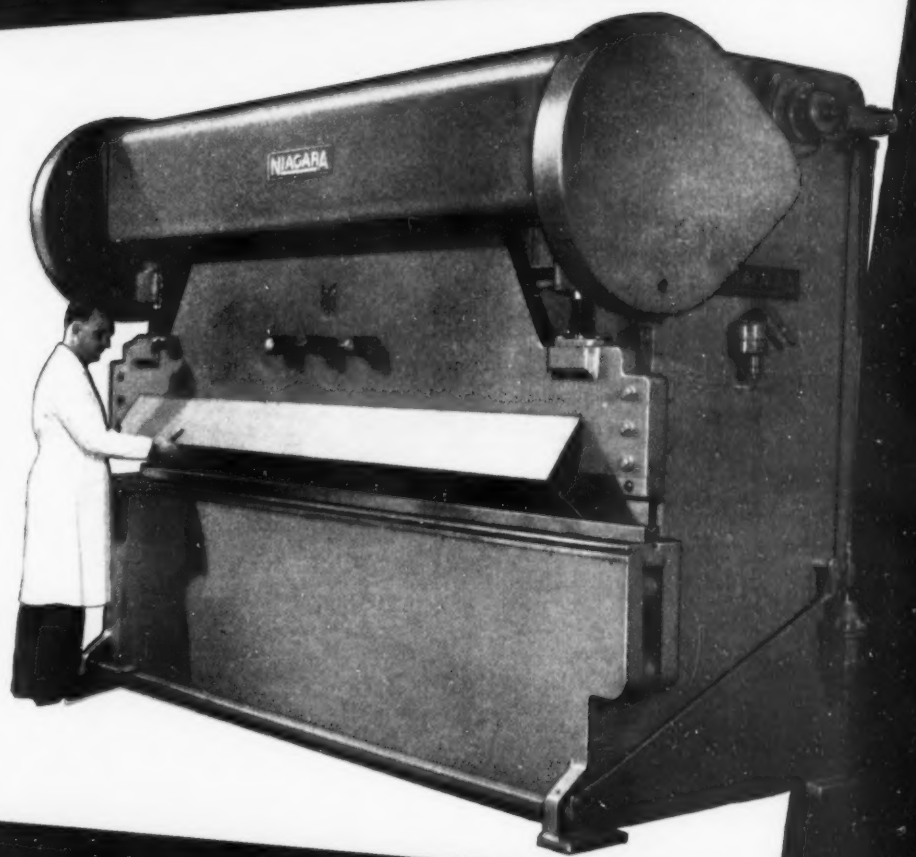

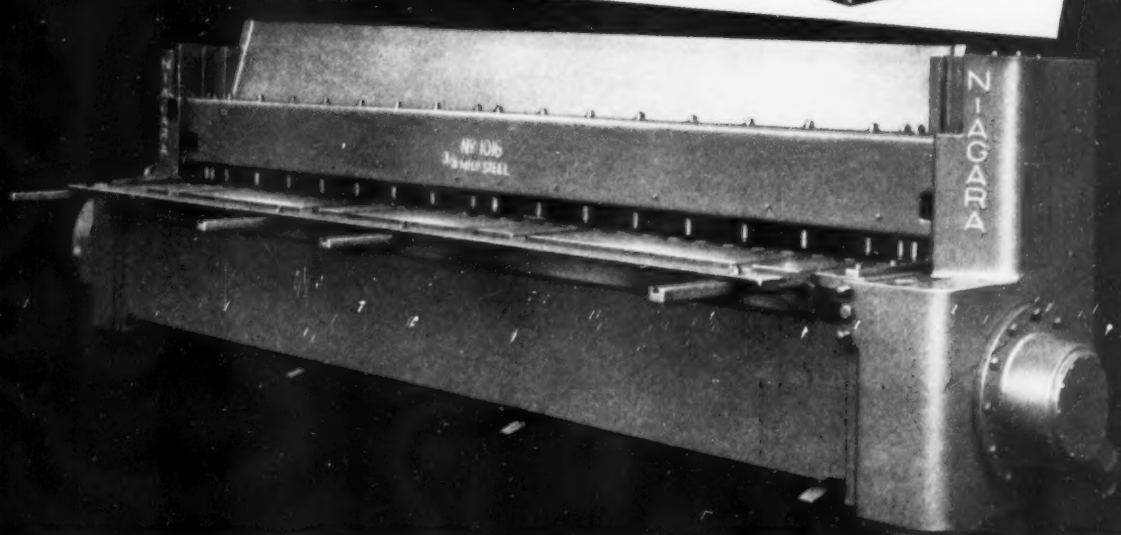

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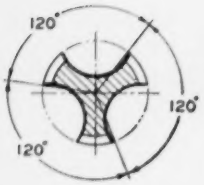

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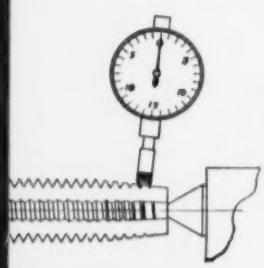

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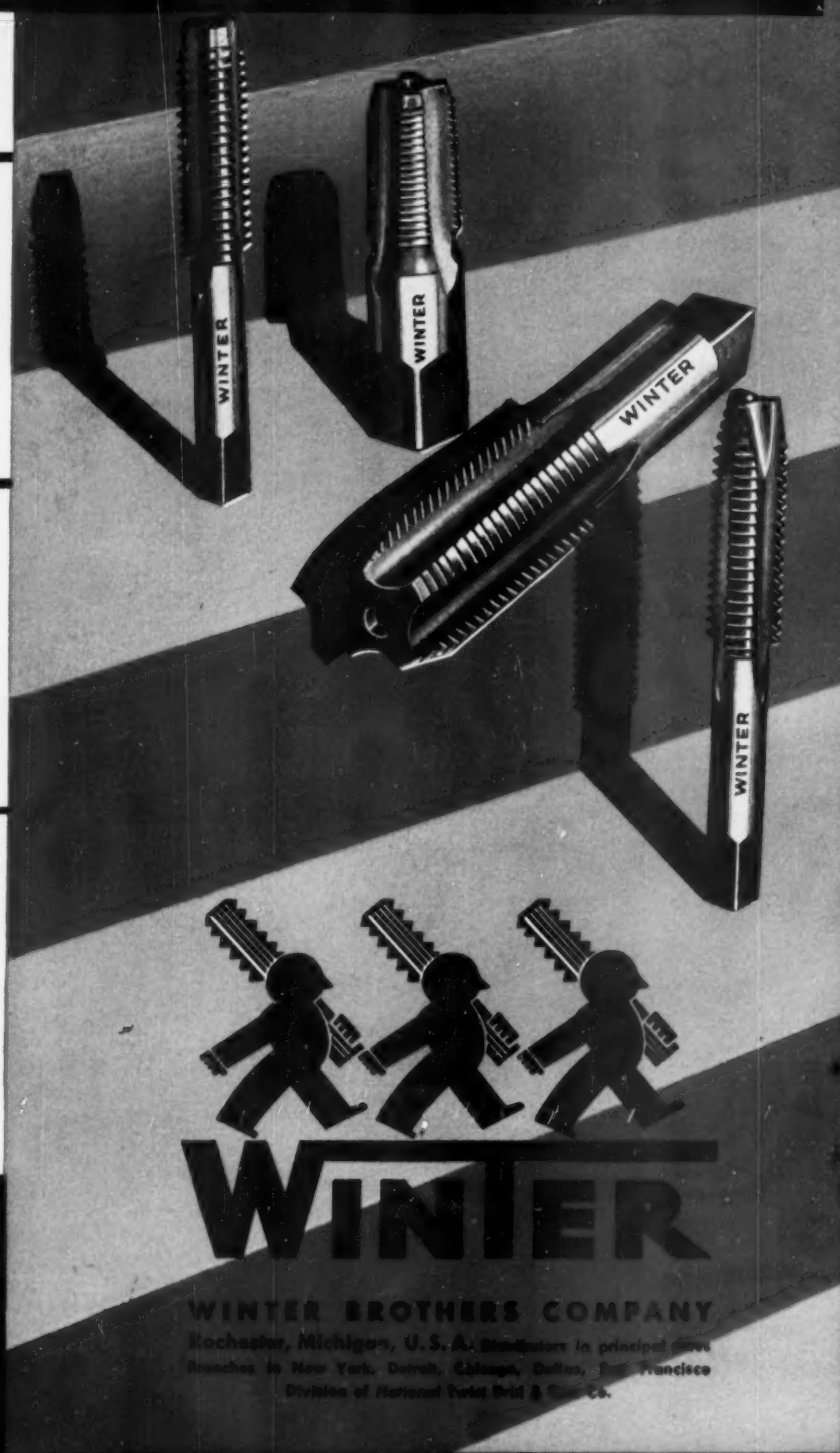

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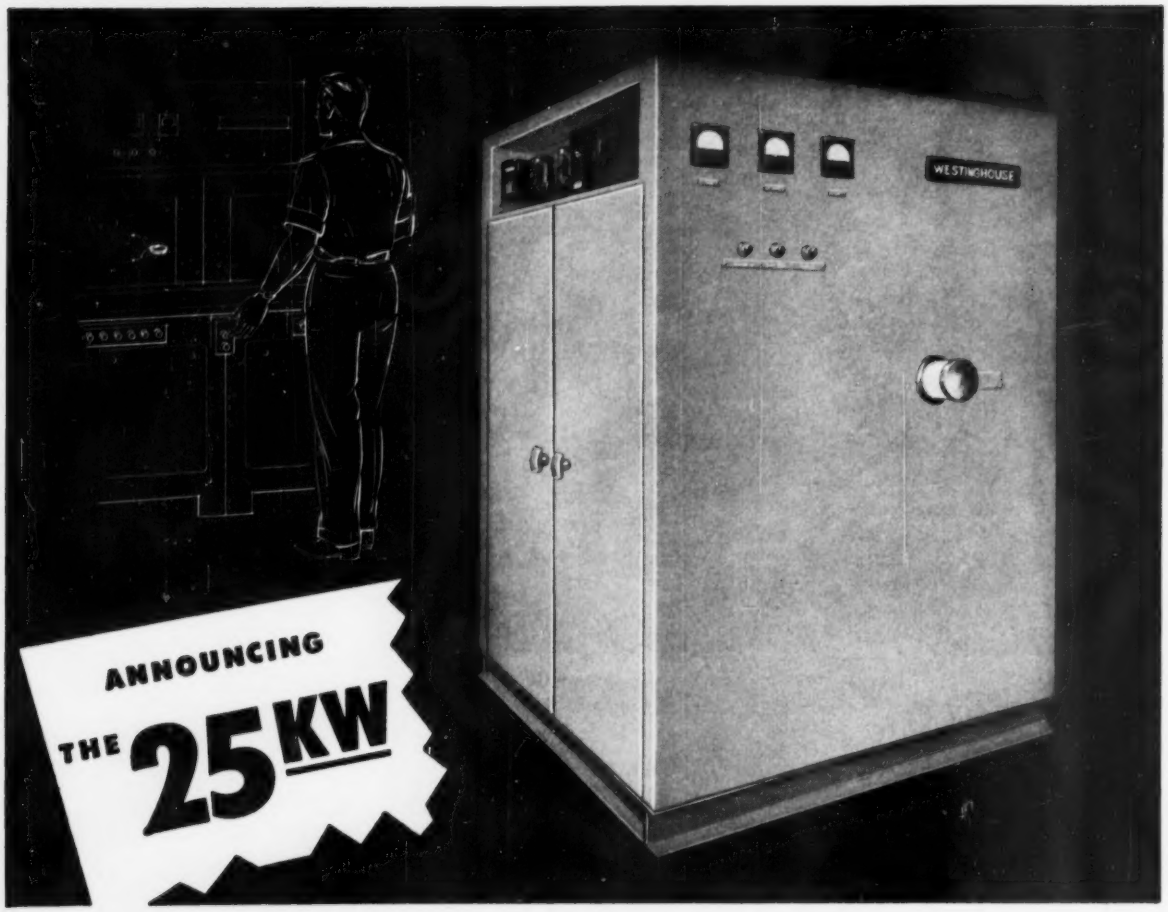

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Westinghouse now presents a new high-frequency generator with 25 KW output at 100% duty cycle. For optimum performance, the new 25 KW has a tank kva of 1620. This means you can now put full power into a wider variety of loads . . . even where close coil coupling is impractical. Non-ferrous materials, like brass, copper and aluminum, can be heated in much shorter time. You benefit in higher production rates at lower costs.

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- Gives complete protection against condensation and water impurity troubles. The built-in distilled water cooling system and heat exchanger offers substantial raw water economy, too.
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The new Westinghouse 25 KW RF Generator is available now in this de luxe model. A standard model is also available with electronic keying and smooth power output control features as easily-installed optional accessories. Both models offer flexible, economical handling of hardening, annealing and metals-joining jobs. For full information write: Westinghouse Electric Corporation, Electronics Division, Induction Heating Section, 2519 Wilkens Avenue, Baltimore 3, Maryland.

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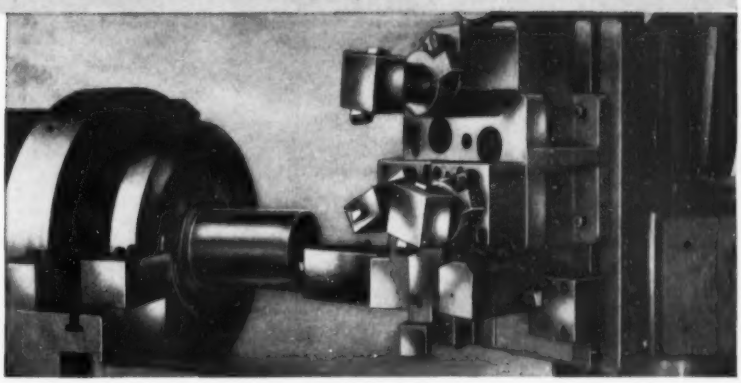

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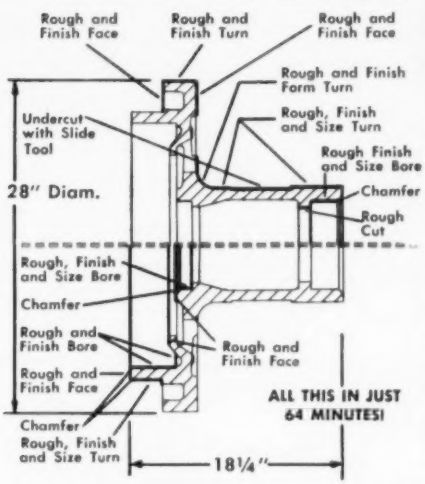

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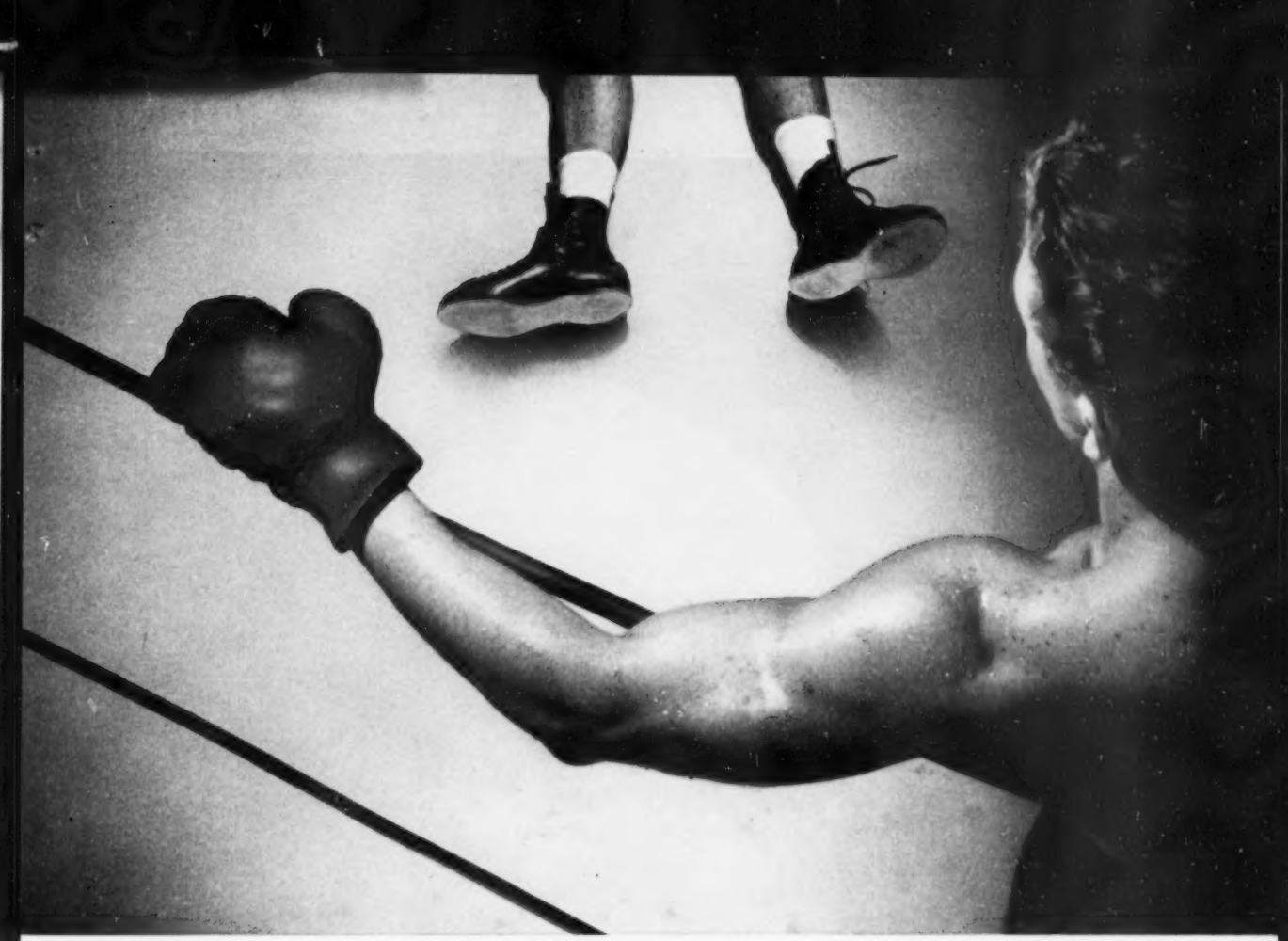

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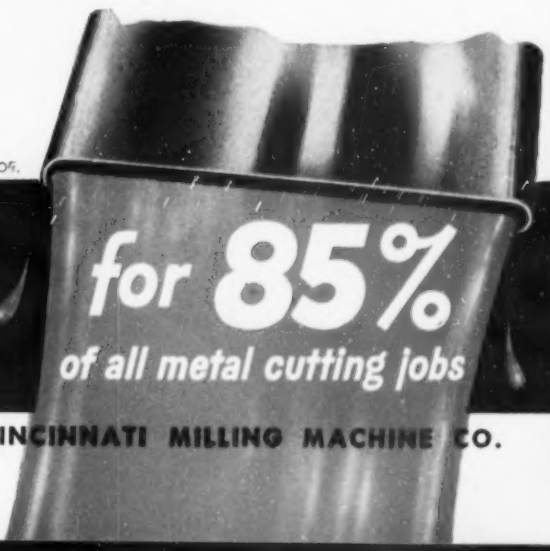

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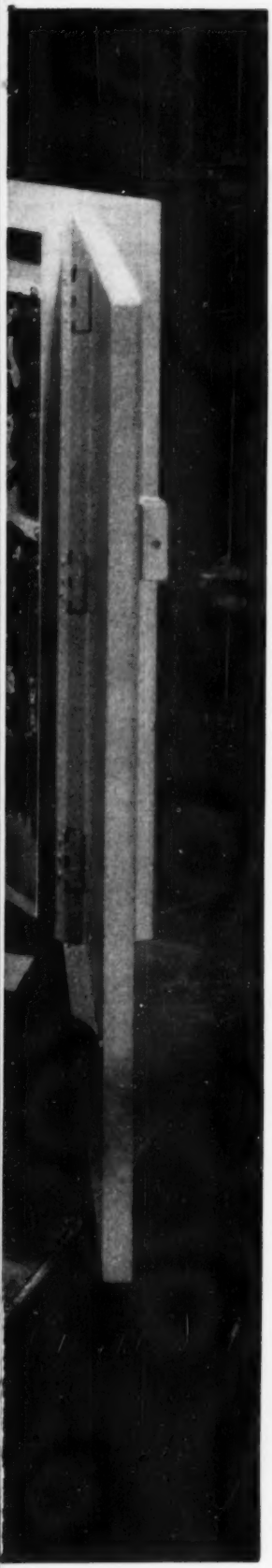

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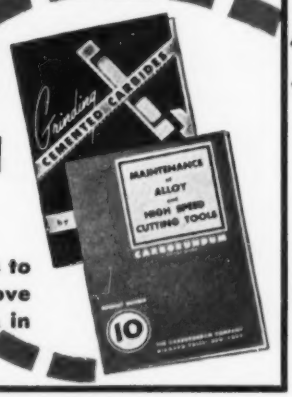

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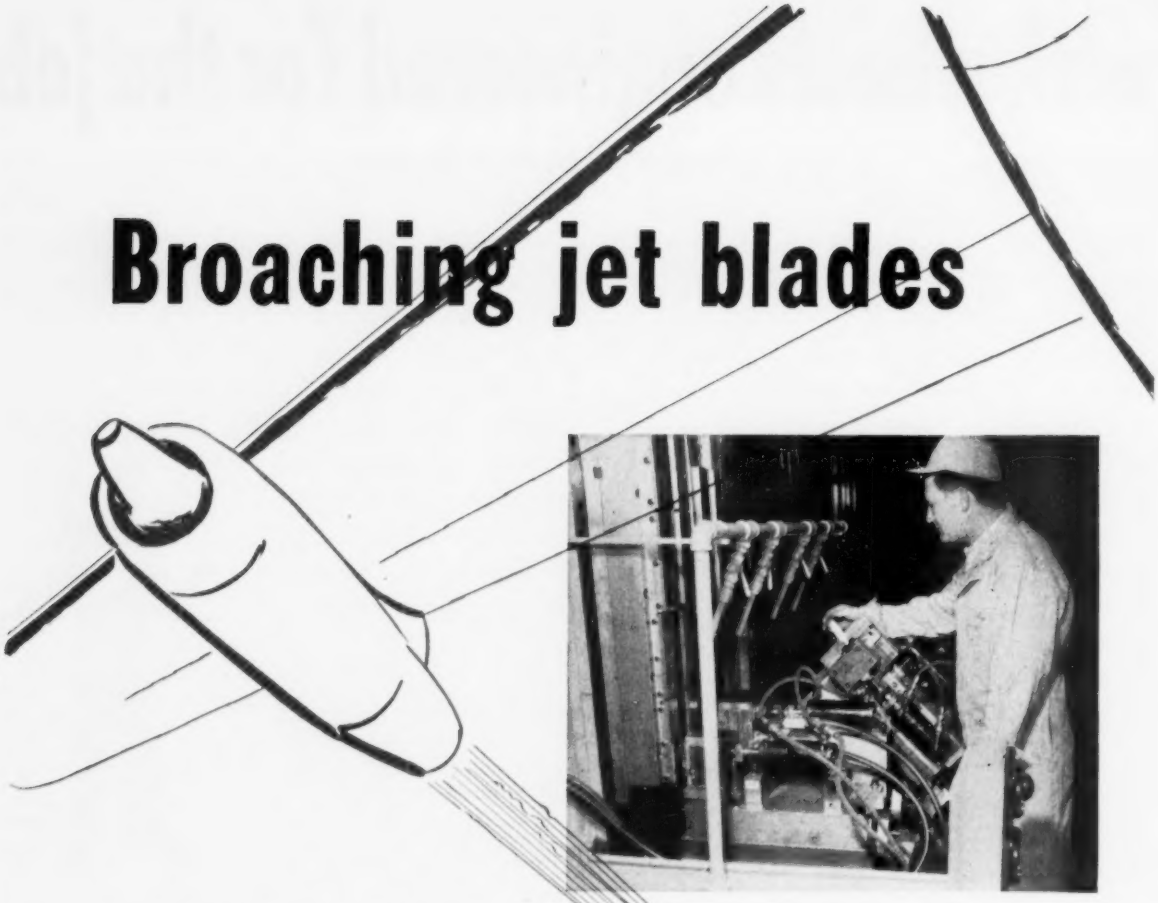
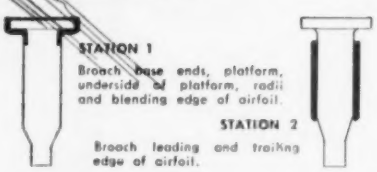


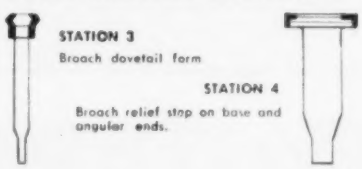
American Dual Ram Surface Broaching Machine performs 4 operations on stainless steel blades

To broach stainless steel jet compressor blades, American installed standard vertical hydraulic dual-ram surface broaching machines with tilting work tables. Each machine was arranged with 4 broaching stations, two at each ram. One of each of the operations shown are performed at each of the 4 stations. The parts are automatically clamped and unclamped with the operator loading the stations at one ram while the other is broaching.

For answers to your broaching problems write to American — the company that makes all three — machines, fixtures and broaches.


STATION 1
Broach base ends, platform, underside of platform, radii and blending edge of airfoil.
STATION 2
Broach leading and trailing edge of airfoil.

HERE ARE THE FOUR JET BLADE SURFACES BROACHED



Catalog #300 illustrates and describes American surface broaching machines. Send for a copy for your files.

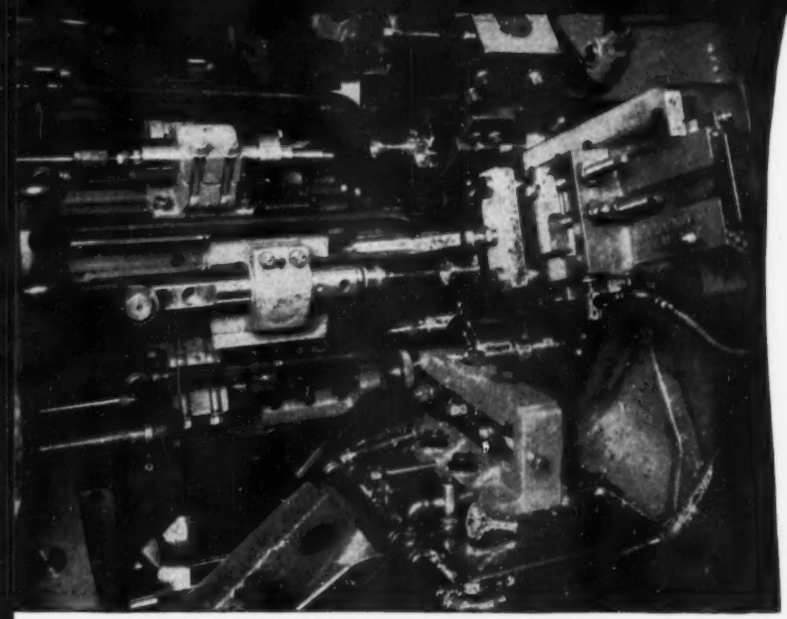
American BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

American Building - Ann Arbor, Michigan

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

more operations on the same machine . . .

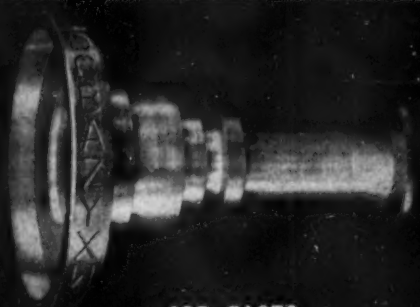


to reduce rehandling costs

The stencilled letters on this piece are now done by a geared attachment operating in one of the regular tool positions on a Standard Acme-Gridley 6 spindle Bar Automatic. Previously, this "extra operation" had required rehandling the piece at an added investment for machine, floor space and costly operating man-hours.

This example again emphasizes two important advantages which have been developed to a singularly high degree in

Acme-Gridley **MULTIPLE SPINDLE BAR AUTOMATICS**



JOB FACTS:

PART: Type Guide Wheel.

SIZE: 1 5/8" dia. x 1 7/8" long.

MATERIAL: 245-T aluminum rod.

OPERATIONS: 19 operations on 6 outside diameters, 5 inside diameters — including geared type stencilling attachment, reaming and shaving attachments for fine finish all over.

TOLERANCES: on second shoulder behind stencil section .0005; on 3/8" reamed hole entire length of piece, .001.

MACHINE TIME: 17 seconds, 212 per hour, on 2" six spindle Acme-Gridley Bar Automatic.

ADAPTABILITY—basic machine design provides for simultaneous use of a wider variety of tools and attachments than found in any other bar automatic.

TOOLING INGENUITY—alertness to conceive new attachments and tools arranged in more combinations to perform more operations, backed by an unmatched experience in tooling more than 45,000 Acme-Gridley automatics—eliminates work rehandling costs.

Ask Acme-Gridley tool engineers for modern tooling recommendations—then compare for *time* and *costs*.

The NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics, 1-4-6 and 8 Spindle—Hydraulic Thread Rolling Machines—Automatic Threading Dies and Taps—Limit, Motor Starter and Control Station Switches—Solenoids—Contract Manufacturing

Remember—Industry can't do **TODAY'S** job . . . with **YESTERDAY'S** tools . . . and be in business **TOMORROW**

Got a tough centerless stock removal problem?

Here's the grinding wheel that will absolutely solve it!

Plant after plant is discovering that the *smartest solution to tough stock removal problems in centerless grinding is a* CINCINNATI Grinding Wheel. Because CINCINNATI Wheels go hand-in-hand with centerless grinders.

And with a Cincinnati Milling-trained machinist on the job to help you get the most out of CINCINNATI Grinding Wheels, you can count on a quick answer to that tough stock removal problem.

Why are we so sure that we can help you? Well, there are three big reasons:

I CINCINNATI Grinding Wheels are used by—and developed by—Cincinnati Milling, which has done more research, had more experience and made more centerless grinders than any other organization in the world.

Stock removal problem as tough as mastering a chip shot. Club heads came to grinder as rough forgings (unmachined). About .040" stock had to be removed from shaft end and shaft ground to a taper in one operation. See Case History (upper right) for solution.

2 We've solved hundreds of centerless grinding problems using CINCINNATI Grinding Wheels. These problems have not been confined to stock removal. They include a complete variety—such as roundness, taper, sizing and production.

3 CINCINNATI Grinding Wheels represent 25 years of Cincinnati Milling research and practical experience based on an entirely new approach to grinding wheels—the development of the grinding wheel as a true cutting tool.

We are so confident—so absolutely sure—that CINCINNATI Grinding Wheels can help solve your tough centerless problem that we make this *unconditional offer:*

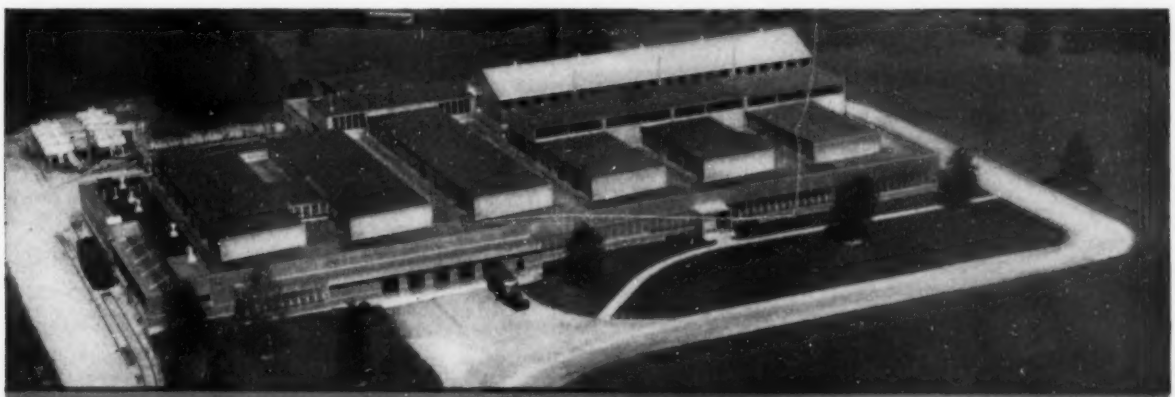
> Either you must be completely satisfied, or we will make no charge for the CINCINNATI Grinding Wheel used.

If you have a tough centerless problem, contact us at once. We'll send one of our expert machinists—men who are Cincinnati Milling-trained and know grinding and grinding machines as well as grinding wheels. He can show you how to get the most out of CINCINNATI Grinding Wheels and help you solve that tough centerless problem. There is no charge for the service of this expert machinist. Write, wire or phone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

How
CINCINNATI Grinding Wheels
Solved Tough Centerless
Stock Removal Problem

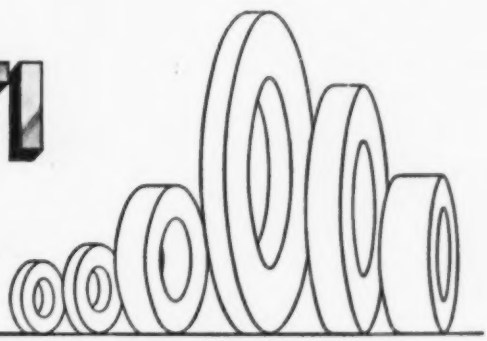
CASE HISTORY No. 712

The job	Grinding the shaft end of golf club heads.
The machine	Cincinnati No. 2 Centerless.
The problem	Stock removal. The heads come to the grinder as rough forgings (unmachined). About .040" stock must be removed and the shaft ground to a taper in one operation.
The solution	A Cincinnati 2A36-S6-VL wheel ground more than 25,000 parts — 25-30% more than any competitive wheel had produced — plus a 10% increase in parts per wheel dressing. Wheel size 20" x 2-1/2" x 12".

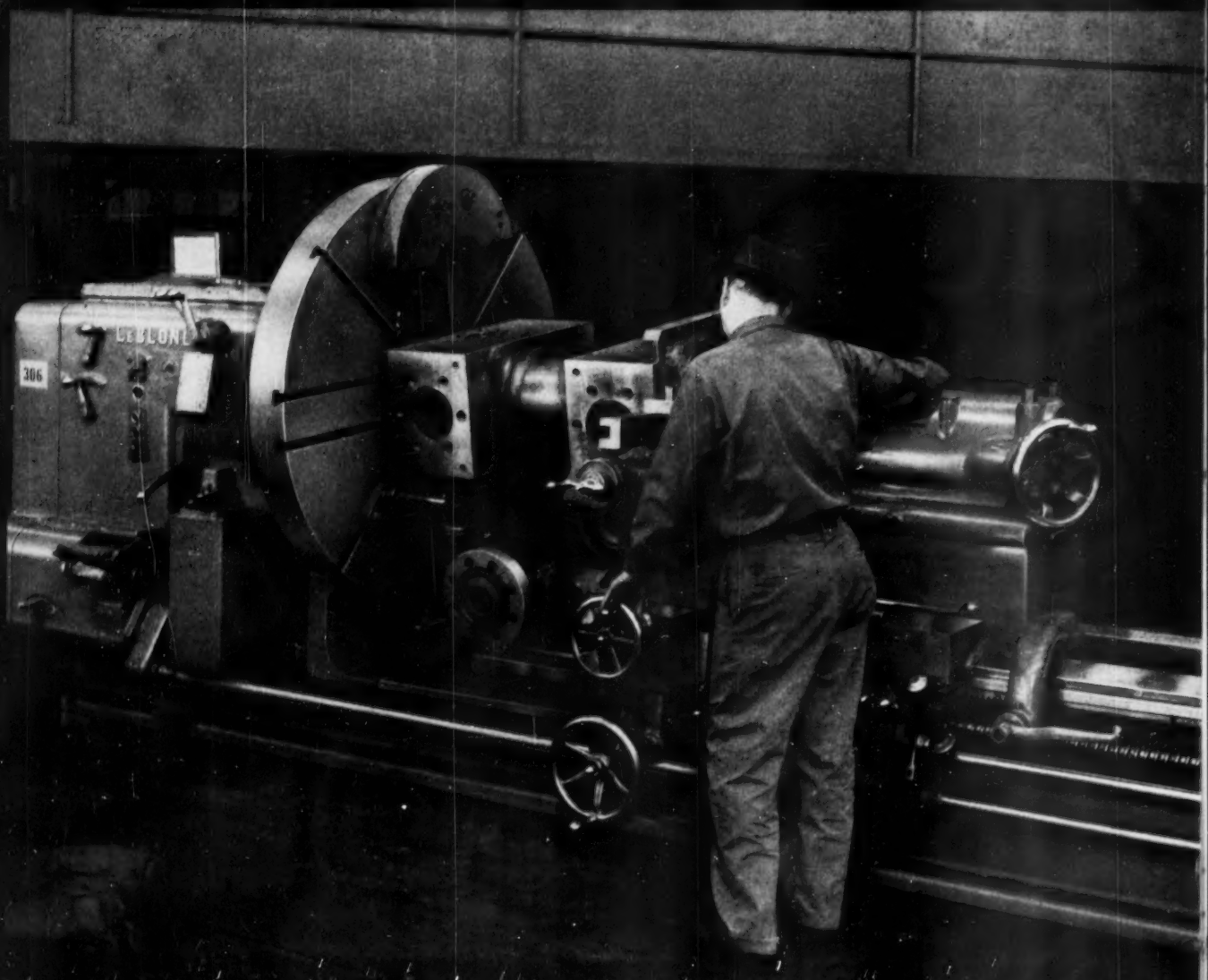


CINCINNATI GRINDING WHEELS are manufactured in this new, completely modern Cincinnati Milling plant.

CINCINNATI
Grinding Wheels
THE CINCINNATI MILLING MACHINE CO.
Cincinnati 9, Ohio



Le Blond Gap Lathe stars in 16-hour Variety



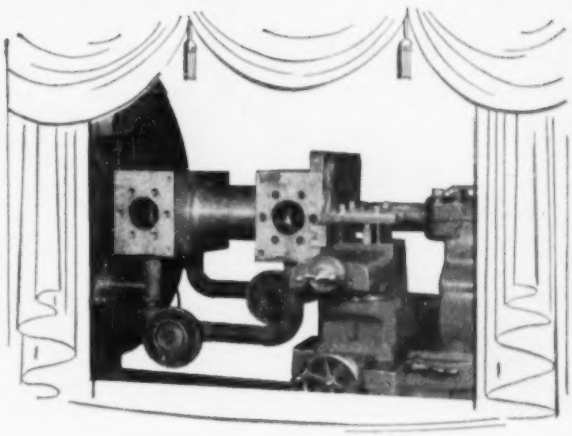
In operation shown, LeBlond 32" / 60" Sliding Bed Gap Lathe is used to finish faces of compressor cylinder. Faces must be made parallel, square to bore. Extending manifolds require 78" swing. Job is supported on plug centers, weighs about 3 tons. Spindle speed, 76 rpm; feed, .010; 2 cuts; job time, approximately 110 minutes.

Show at Clark Brothers

Juggles Diameters From 6" to 78"

... Satisfies Critics

with Stellar Performance!



Clark Brothers Company, Olean, New York, had to "book" a one-lathe act—a single machine to turn out a wide variety of components for "Big-Inch" Type compressors. A special lathe for occasional large-diameter work was too costly.

"Talent scouts" at LeBlond's Buffalo distributor, The Buffalo Machinery Co., recommended their hottest variety number—a LeBlond 32"/60" Sliding Bed Gap Lathe.

Now this versatile machine performs 16-hours-a-day at Clark Brothers, takes the place of at least two machines. One specialty is truing-up and finishing heat-distorted compressor cylinders with manifolds already welded in place—faces must be made parallel. The sliding bed of the LeBlond Gap lathe opens up readily to meet the *78" swing requirement.*

With gap closed, it operates as a standard heavy duty engine lathe, turns power cylinders and cylinder liners *ranging from 6" to 30" diameters, requiring tolerances of ± .0015".*

The multi-purpose LeBlond Sliding Bed Gap Lathe is a sweetheart in the shop. Has adjustable gap and center distance. Four-way rapid traverse. Thirty-six spindle speeds are available, 5 to 500 rpm. Sixty feeds and threads. And, of course, you get all the well-known LeBlond features—hardened and ground steel bed ways, totally enclosed quick-change box, automatic lubrication, one-piece apron, thrust-lock tailstock and many more.

Whether your turning jobs call for versatility or production, heavy hogging or fine finishing, there's a LeBlond Lathe to turn them better, faster. Your LeBlond Distributor will tell you about the three Sliding Bed Gap Lathes, 16"/38", 25"/50", and 32"/60". Call him or write The R. K. LeBlond Machine Tool Company, Cincinnati 8, Ohio.

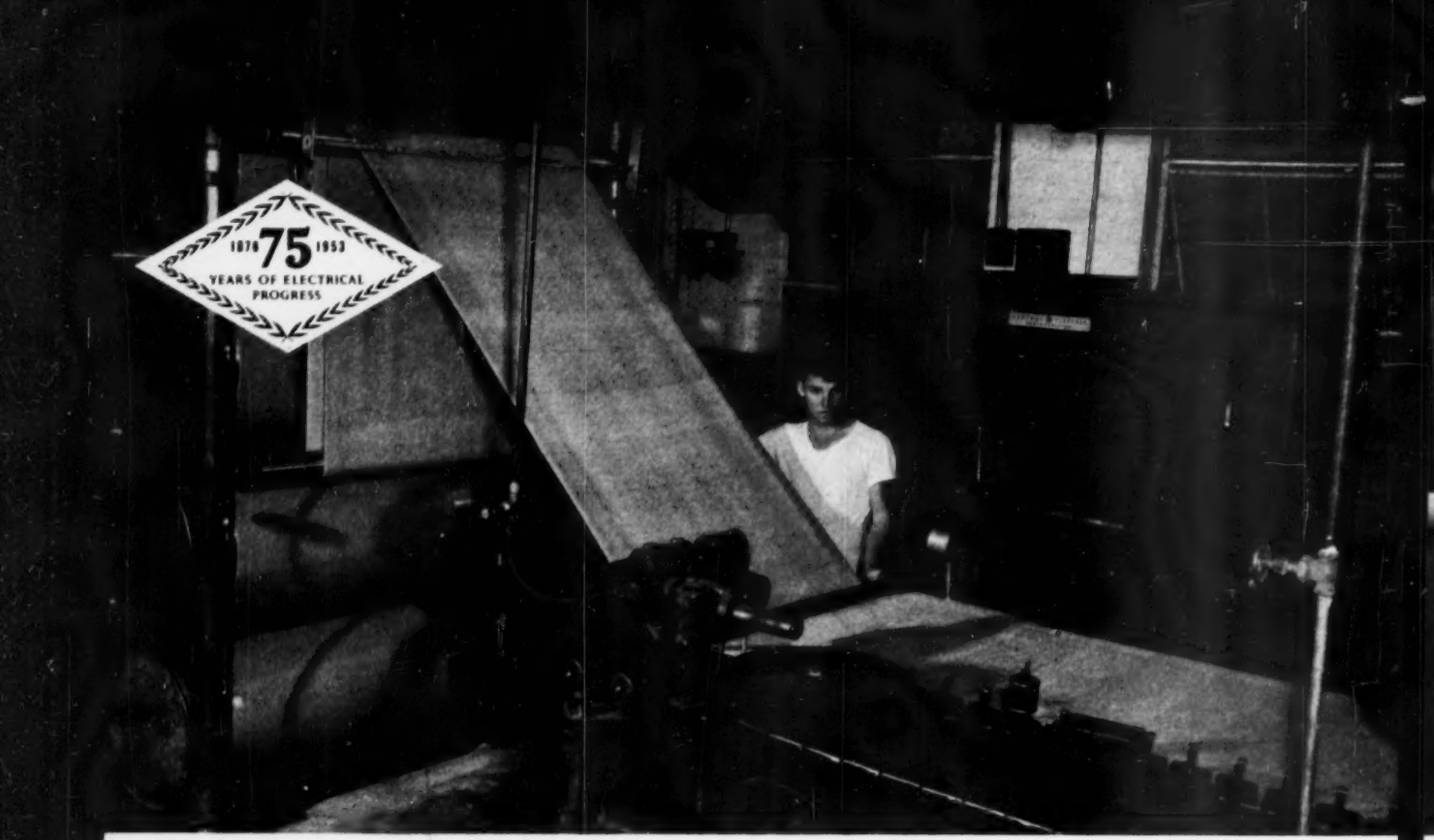
Ask for Bulletin SBG-103
for more information
on LeBlond Sliding Bed Gap Lathes.

Cut with Confidence

LeBLOND *of Cincinnati*

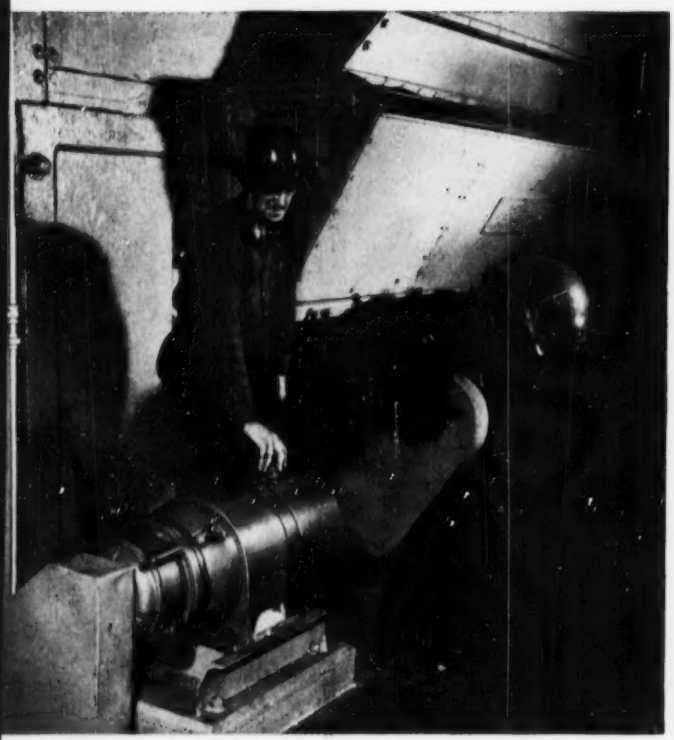
THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 66 YEARS*

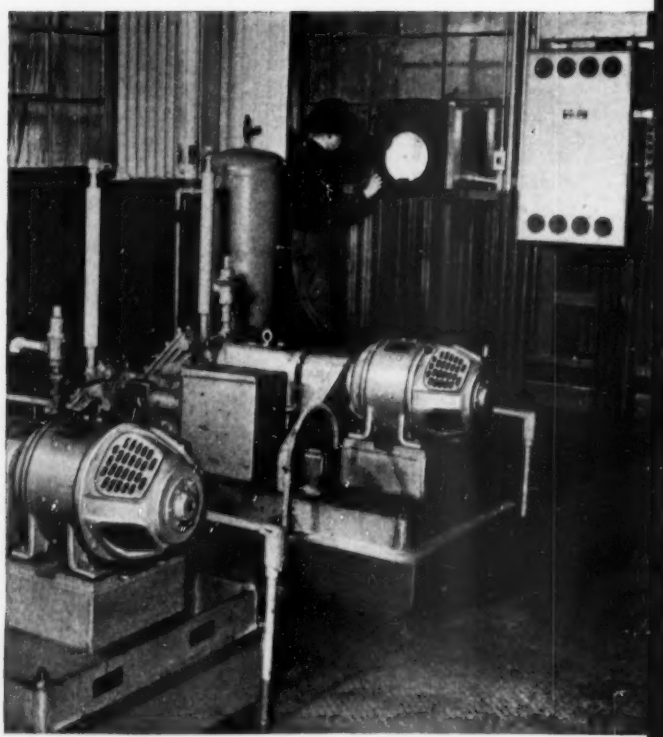


CONTROL SENSITIVITY of the G-E Speed Variator at the Jefferson Mill Inc., Jefferson, Ga., helps cut costs by enabling the operator to speed up the splicing of the cloth rolls . . . enables him to easily control processing speed for any type of cloth. The Speed Variator is a packaged unit . . . easily installed in any convenient location . . . provides your machine with stepless speed control up to a 40 to 1 ratio.

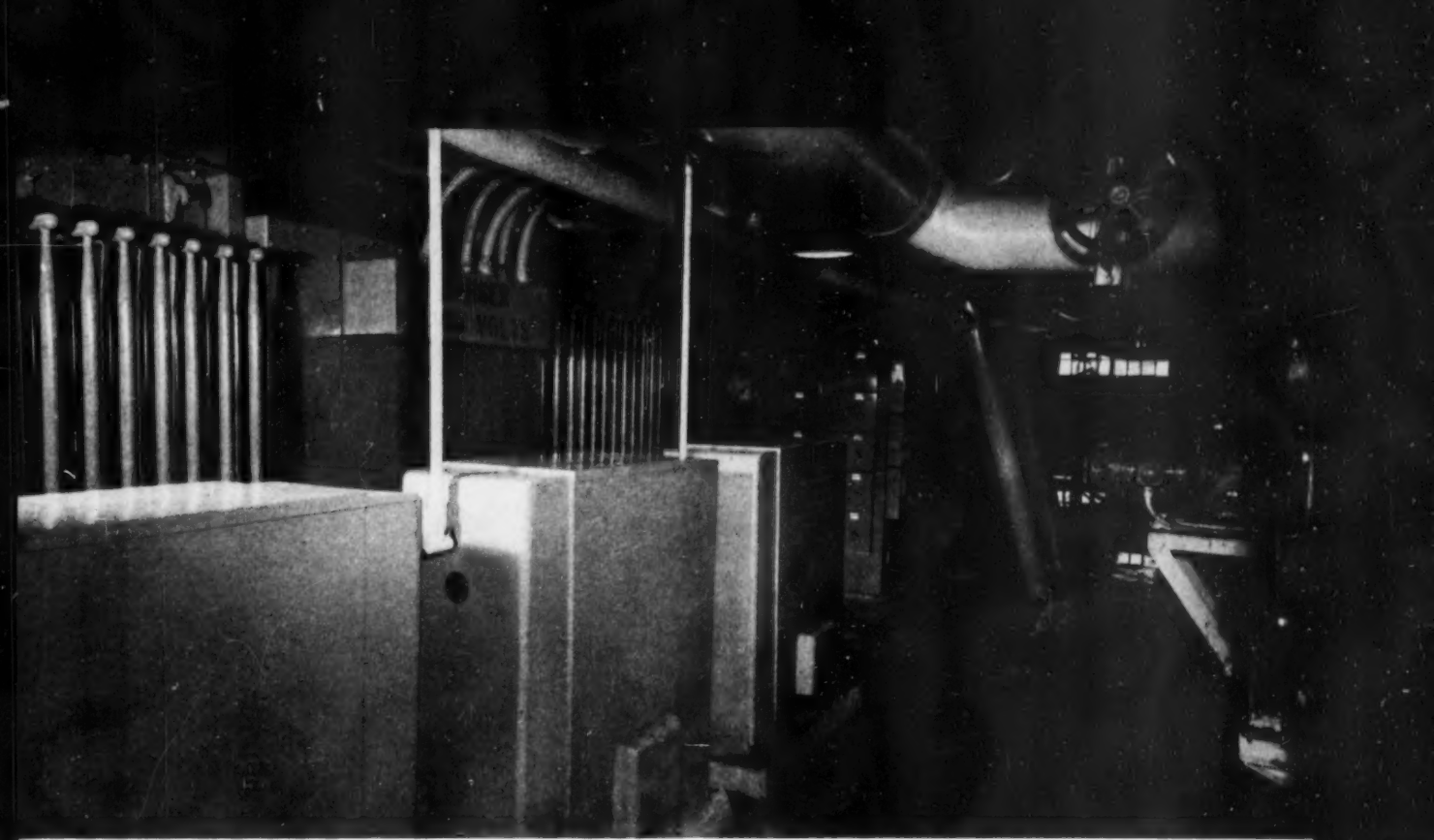
Cut Costs by modernizing your machines



G-E ACA MOTORS now control coal stokers at the Socony-Vacuum Oil Co., Inc., Olean, N. Y. Working directly from AC current the ACA motor offers low cost, low range stepless speed adjustment.



G-E THY-MO-TROL DRIVE accurately controls chemical proportioning pumps at Fibreboard Products, Inc. East Antioch, Calif. This electronic drive offers precise control in speed ranges up to 100 to 1.



G-E SPEED VARIATORS at the Ohio Boxboard Co., Rittman, Ohio, centralize control of various stock preparation processes . . . guard stock thickener speeds. Here you see three of the Speed Variator units—foreground . . . Available in ratings from 1 to 200 hp the versatile G-E Speed Variator can be adapted for even closer speed regulation by the addition of an amplidyne or electronic regulator.

with a G-E Adjustable-Speed Drive!

Here are four manufacturers who have effectively improved one or more of the manufacturing operations in their plants by modernizing their equipment with G-E Adjustable-Speed Drives.

In the same way the proper application of adjustable speed can minimize waste and increase production for you. In addition, adjustable speed by making your present equipment more flexible, will enable you to manufacture a greater variety of goods.

G-E Adjustable-Speed Drives give you economical speed regulation as close as 1% if necessary . . . assure you of correct stepless speed adjustment. Standard drives are available in ratings from 1/40 to 200 hp with speed ranges from 3 to 1 up to 100 to 1.

For full information consult your nearest General Electric Apparatus Sales Office. Your G-E Sales representative will be glad to recommend the most economical drive best suited to your operation. For printed information on the complete line of Adjustable-Speed Drives, use the coupon.

You can put your confidence in—

GENERAL ELECTRIC

LET G.E. HELP YOU PICK THE RIGHT DRIVE

Because only General Electric makes all major types of electric adjustable-speed drives, it is best qualified to help you select the right drive. Send for these informative bulletins.

☐ **A.** This 26-page manual describes **all** four types of drives and where to apply them. Bulletin GEA-5334.

☐ **B.** Lower cost, simplest a-c drive. Bulletin GEA-4883.

☐ **C.** More flexibility, moderate cost. Bulletin GEA-5335.

☐ **D.** Top performance, 1/40—30 hp. Bulletin GEA-5337.

☐ **F.** Top performance, 1–200 hp. Bulletin GEA-5336.

General Electric Company
Section H 646-24
Schenectady 5, N. Y.

Please send me the bulletins checked
☐ for reference only
☐ for planning an immediate project

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COMPANY .....

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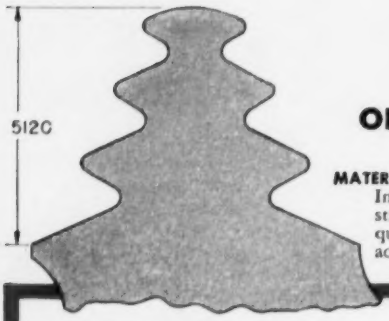
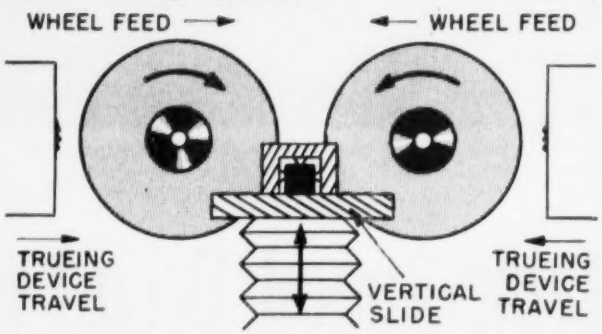
CITY ..... **STATE** .....

FORM GRINDING
JET ENGINE BUCKET ROOTS
FROM THE SOLID!

ON J & L DUAL-WHEEL AUTOMATIC FORM GRINDERS



MATERIAL BORDERS ON UNMACHINABLE Intense heat and great centrifugal stresses on the pressure surfaces require the toughest material and most accurate finish.



Bucket is mounted on a reciprocating vertical slide for two-way grinding.

AUTOMATICITY SPEEDS PRODUCTION — MAINTAINS REPETITIVE ACCURACY — Operation is simplified to the push button stage by a completely automatic work cycle.

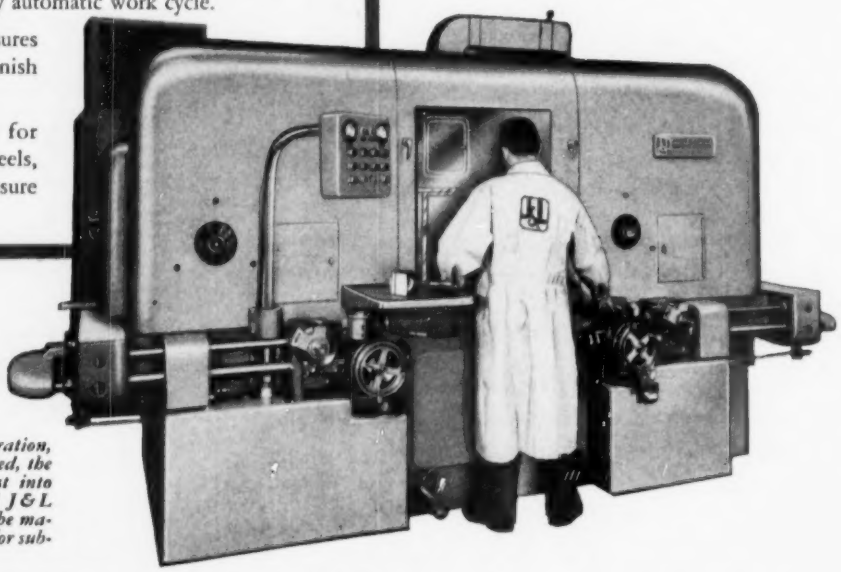
Automatic wheel trueing assures accuracy of form — includes finish trueing before final cut.

Automatic compensation for amount dressed off the wheels, and automatic wheel feed assure accurate sizing.

FEW MORE DIFFICULT GRINDING JOBS EXIST — Yet both sides of the root are ground simultaneously, to gage tolerances, on a production basis.

REPETITIVE ACCURACY MAINTAINED
Spacing of pressure surfaces within .0002
Taper within .0005
Angles within 10 minutes
Thickness from .0005 to .001

ACHIEVEMENT RESULT OF SEVERAL YEARS' RESEARCH AND EXPERIMENTATION — This application of the proven principles, long incorporated in J & L Thread Grinders, was initiated several years ago. The first machine was delivered in 1948. Continued study and subsequent refinements have helped lick one of the toughest machining problems of our day. Perhaps we can help you too.



Before the grinding operation, the foil contour is checked, the blade oriented and cast into a matrix, on a special J & L Optical Comparator. The matrix serves as a fixture for subsequent operations.

JONES & LAMSON

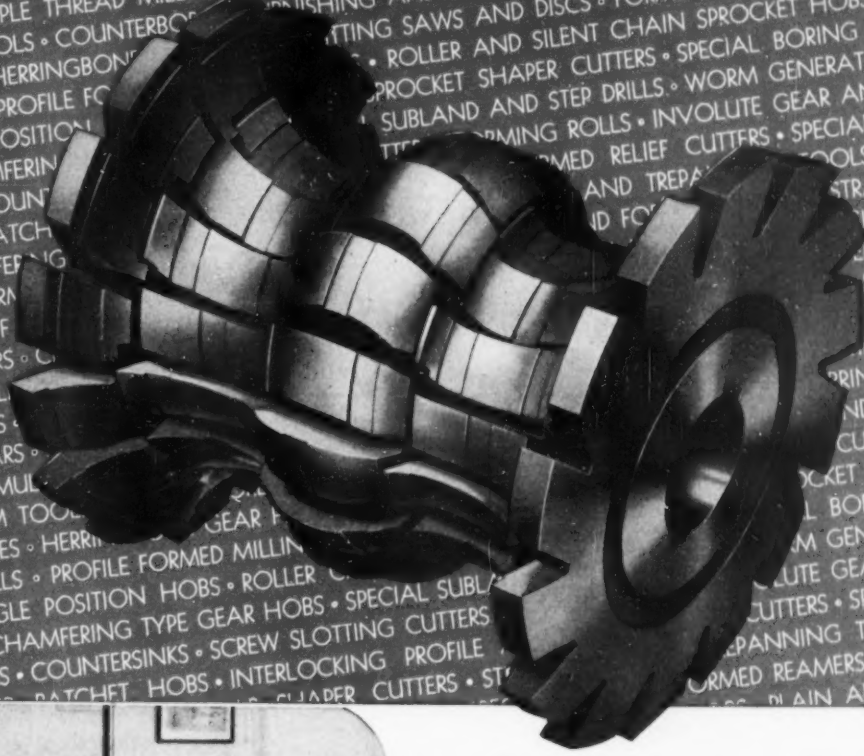
Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 502 Clinton St., Dept. 710, Springfield, Vt., U.S.A.

THREAD GRINDER DIVISION

FOR THOSE TOUGH Special JOBS
DEPEND ON

National Tool Co.

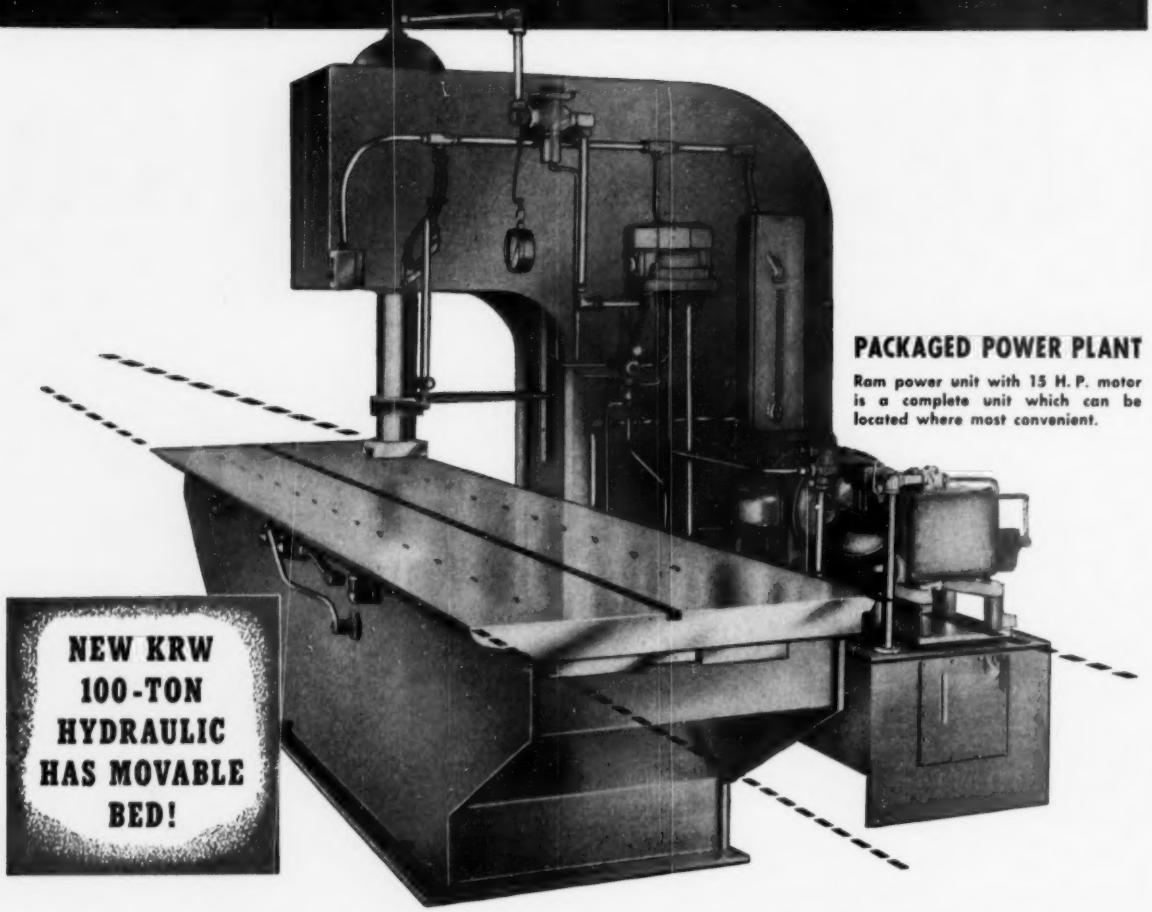


● Years of successful experience in *special* tooling and related production problems are yours for the asking. When the job requires *special* cutting tools call in your National Tool Co. representative. He is backed by more than 46 years experience in the engineering and manufacture of *special* cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.

Since 1905 engineers and manufacturers of high-quality special cutting tools for the metal-working industry

National
TOOL CO.
Cleveland 2, Ohio

NEW PRESS BRINGS THE WORK TO YOU!



PACKAGED POWER PLANT

Ram power unit with 15 H. P. motor is a complete unit which can be located where most convenient.

NEW KRW 100-TON HYDRAULIC HAS MOVABLE BED!

Here's KRW's newest time-saver! It's a 100-ton Hydraulic Press with an extra-long 16 foot bed that moves more than 3 feet in either direction. Now being used for important straightening work by some of America's largest manufacturers of airplane forgings. Due to the extra-long movable bed, straightening work on large pieces can be accomplished with greater facility and speed. Ideal for manufacturers and fabricators of extra-long parts that require straightening work. Press bed has independent motor drive. Hydraulic motor doesn't have to be running to move the press bed back and forth.

This new KRW press has a unique load-control feature. An applied ram load can be maintained at any pressure setting from 10 to 100 tons without holding manually controlled lever at applied position. Operator can bring ram load to desired tonnage and remove hand from control lever. Lever automatically returns to neutral but applied load will be retained until manually controlled lever is moved to reverse position for lifting ram. This feature saves time on straightening jobs where it is necessary to hold a given pressure for periods of time.

KRW also makes a full line of one, two and three cylinder Hydraulic Presses; hand, air or motor driven; 25-150 ton capacities. Write for details and prices on this or any KRW Hydraulic to Dep't. 11.

SPECIFICATIONS

CONSTRUCTION Cylinder—chrome-nickel-molybdenum steel; C-frame and bed, weldment fabrication; Table, steel.

TABLE CONTROL Separate push buttons for right and left movement. Table stops when manually applied push button is released.

SAFETY PROVISIONS Electrical System—disconnect switches, automatic and manual.

Hydraulic System—pressure relief valves eliminate danger of overload in any part of the Hydraulic circuit.

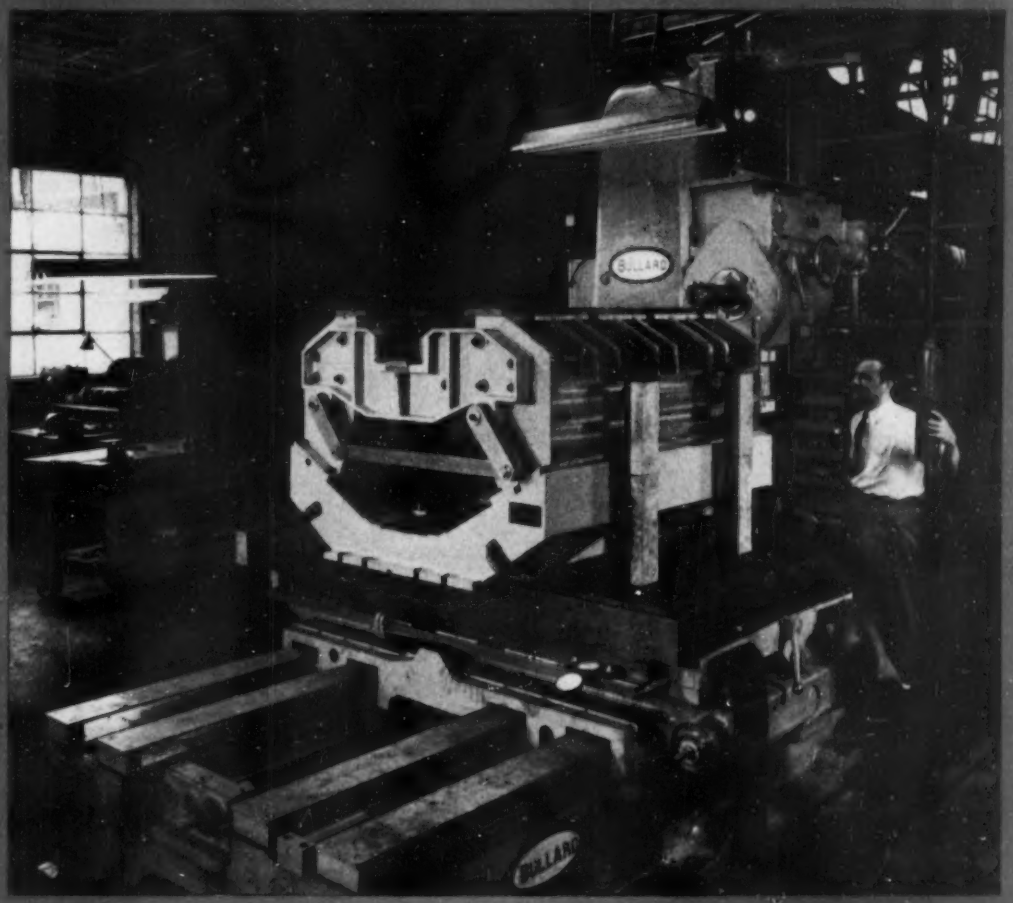
Table and Ram travel is limited by safety switches. Manually adjustable stop limits up-travel of ram.

K·R·WILSON

215 MAIN ST., BUFFALO 3, N. Y.

Designers and Builders of the Right Hydraulic Press to Solve Your Metal-working Problems!

ENGINEERED BY BULLARD



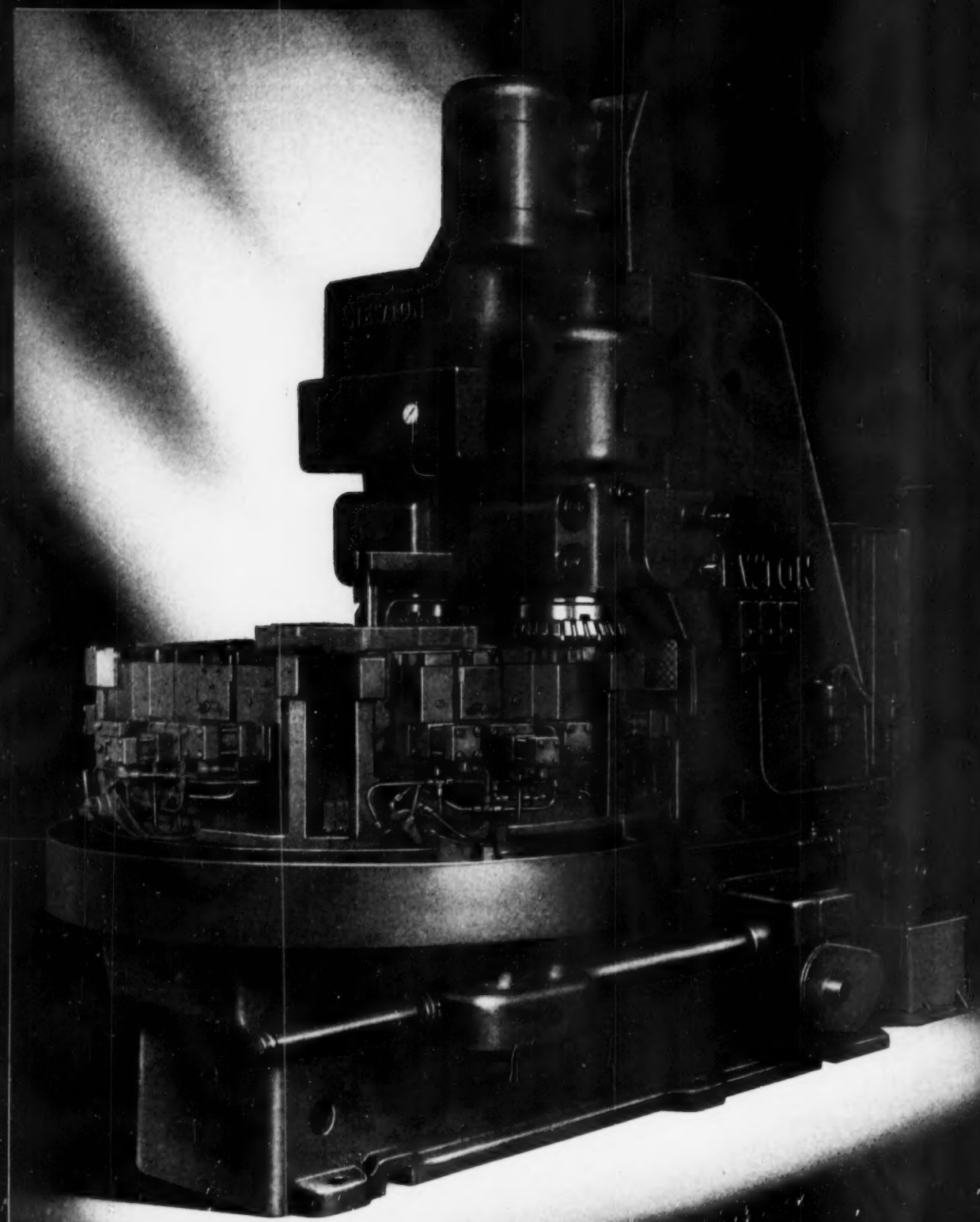
To Make Light Work Of Tough Jobs

A massive machine, The 4-Way Bed Bullard 4" and 5" Spindle Horizontal Boring, Milling and Drilling Machine, assures greater productivity. Sturdy box type saddles and tables, anti-friction extension bar support in the heavier rear post, the motor driven lubrication pump for the gear boxes, hydro-dynamic coupling and main drive with brake motor are some of the features embodied in this machine to maintain a higher degree of accuracy and efficiency.

The versatility and reliability of Bullard Horizontal Boring, Milling and Drilling Machines have been well established in the metal working industry. Ask a Bullard representative to explain its many other features or write to:

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

Telephone 6-2511



CONSOLIDATED MACHINE TOOL

Wholly owned subsidiary of Farrel-

For milling the flat surfaces of repetitive pieces, there is no faster known method than continuous rotary milling!

Newton 48" Continuous Vertical Rotary Milling Machine with hydraulic fixtures that automatically clamp and unclamp as the table turns.

CORPORATION, ROCHESTER, N.Y.

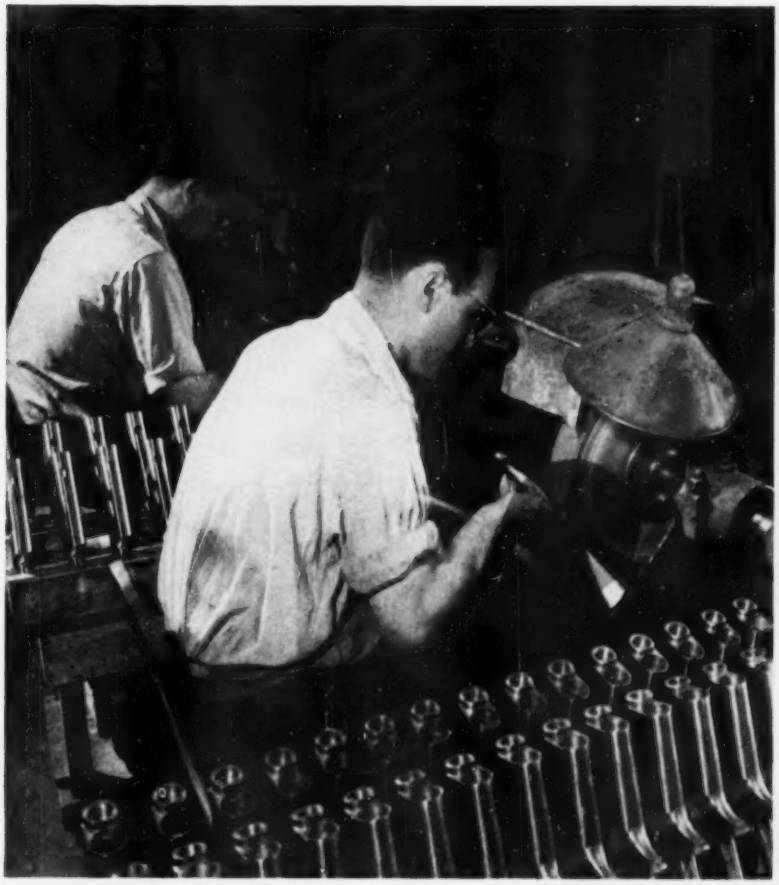
Birmingham Company, Incorporated.

production PLUS

The COPYMATIC Tracer-Controlled Lathe proves that accuracy at production rates *is* possible and profitable. In unanimous reports, owners state their Lodge and Shipley COPYMATICS save up to 87%, pay for themselves in a year or two! Write for NEW Catalog No. 216. *The Lodge & Shipley Company, 3055 Colerain Avenue, Cincinnati 25, Ohio.*

Lodge & Shipley

....your **LODGE-***ical choice!*



Gun polishing with Norton ALUNDUM abrasive. This man has the "Touch of Gold." His work is fast, precise and low in cost. Uniform-sized grain means better quality finishes.

High capillarity Norton ALUNDUM abrasive soaks up water in test; does the same with glue on the job . . . assuring stronger, faster-cutting polishing wheel.

Polish with the

"TOUCH OF GOLD"

You get the right combination for fast and profitable work in Norton ALUNDUM Abrasives*

Every *grain* of Norton ALUNDUM polishing abrasive does its full quota of work! That's one reason your operators get the "Touch of Gold" that adds to the appearance and quality of your product . . . increases your profit margin, too.

You get better polishing at lower cost with ALUNDUM abrasive because each grain is identical with the next . . . hard, tough, long-lived and exact as to size and shape. No oversize grains to mar surfaces — no undersize grains to loaf on the job. Capillary tests show that Norton abrasive grain adheres tightly to the wheel until all its work is done. This assures better performance and longer life — greatest efficiency for you.

Fast service from your Norton distributor brings you the exact type of ALUNDUM polishing abrasive you need. He is backed by complete stocks at key industrial centers, ready for shipment in convenient container sizes . . . and by the specialized experience of Norton field engineers. Or you can write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

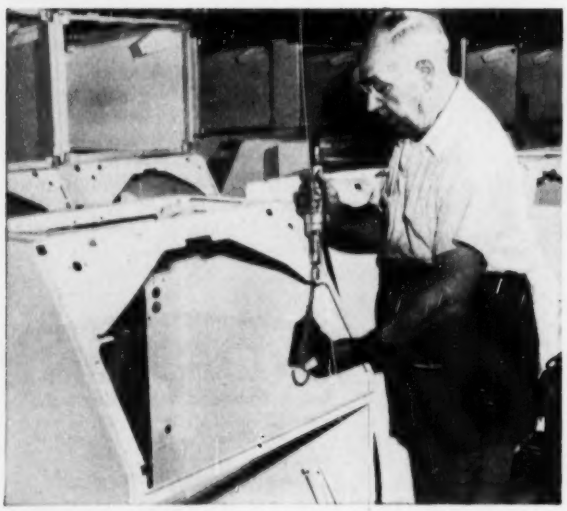
NORTON
ABRASIVES
Making better products to make other products better

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

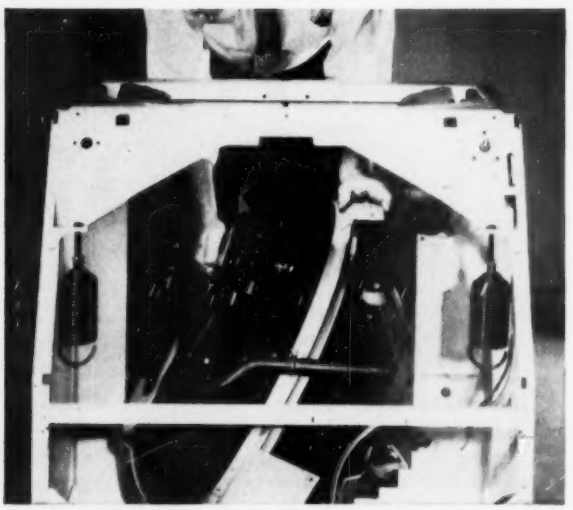
G-256

Over 1,000,000

OVER A MILLION families wash their clothes in Laundromats. Westinghouse also does a big export business, so these machines have to be trouble-free.



HERE, a man installs the main suspension springs. The springs are periodically tested to meet severe 450 c.p.m./⅝-inch amplitude, vibration tests.



AS UNIT IS INSTALLED in shell, man holds top damper spring. Notice damping blocks on end of flat spring to reduce excess movement.

Laundromats in use, but...

"We've never had a failure with American Quality Springs"

says WESTINGHOUSE ELECTRIC CORPORATION

THE Westinghouse Laundromat has been a household word ever since the first unit rolled off the production line in 1940. Since then, Westinghouse has produced over 1,125,000 Laundromats. Despite many important improvements, the superb spring suspension system has stood the test of time. It's the same today as it was in 1940, because it was designed so well in the first place.

Three different styles of American Quality Springs are used in the Laundromat. The *coil* springs support the entire weight of the machine within its shell. The *flat* steel springs contain friction dampers that limit excessive movement caused by an unbalanced load during the spin-dry cycle.

Failure of a coil spring could damage the entire machine. At the least, it would mean an expensive service call. But, because of the efficient design, and the completely reliable American Quality Springs, *no spring has ever failed in a Westinghouse Laundromat.*

If service like this makes sense to you, get in touch with your nearest American Steel & Wire representative. We make all kinds of springs, any steel, any finish. And you'll get the same kind of quality that Westinghouse gets.

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL CORPORATION, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
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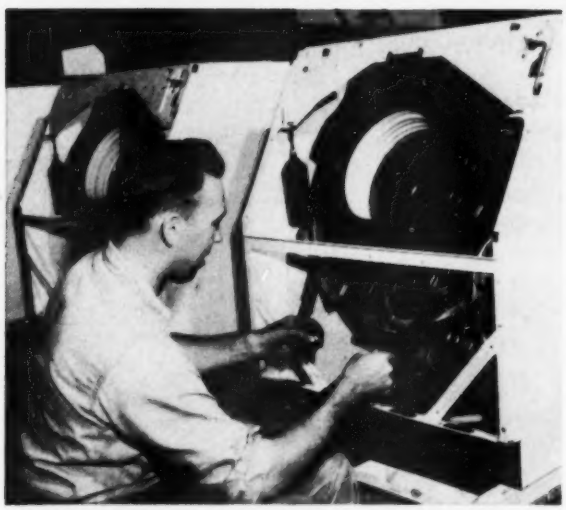
USS

U·S·S American Quality Springs

UNITED STATES STEEL

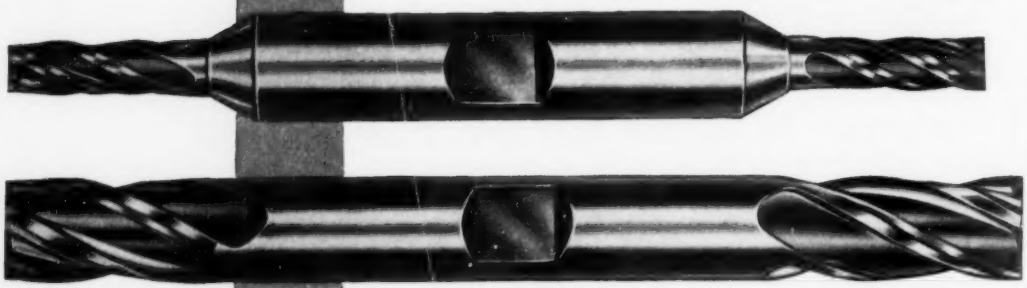


BOTTOM DAMPER springs are installed. Because of the entire engineered suspension, Laundromat was one of the first washers that didn't have to be bolted to floor.

WESTINGHOUSE LAYS DOWN rigid specifications for their American Quality Springs, proving their motto, "Quality must be *built* into a product."

Another Quality Engineered

ATRAX TOOL



Double-End Carbide End Mills
Precision Machine Ground-from-the-Solid

1. Shanks flatted for set screw.
2. Cutter 1/8" to 9/32" diameter of brazed inserted type construction—prevents loosening or separating from steel body, a hazard of conventional built brazed construction.
3. Cutter 5/16" to 1/2" diameter of solid carbide throughout —adding rigidity and strength for extra heavy cuts.
4. Backed by the Atrax quality reputation— the finest carbide tools of this type.
5. Available in 2 and 4 Spiral Flutes.

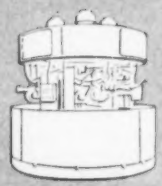
Representatives and Distributors in principal cities in United States and Canada. Write for name of representative in your area.

Send for complete catalog NOW!

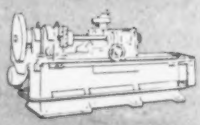
THE ATRAX COMPANY

NEWINGTON 11, CONNECTICUT

12-S HOBBER

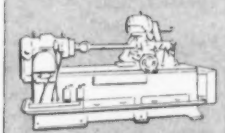


7-A ROTARY HOBBERS



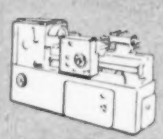
SH SPLINE HOBBER

MODEL 40 THREAD MILLER



HT THREAD MILLER

CRI-DAN "D"



CRI-DAN "B"

FAST THREADING for FLYING HORSEPOWER!

with the AMAZING CRI-DAN "D"

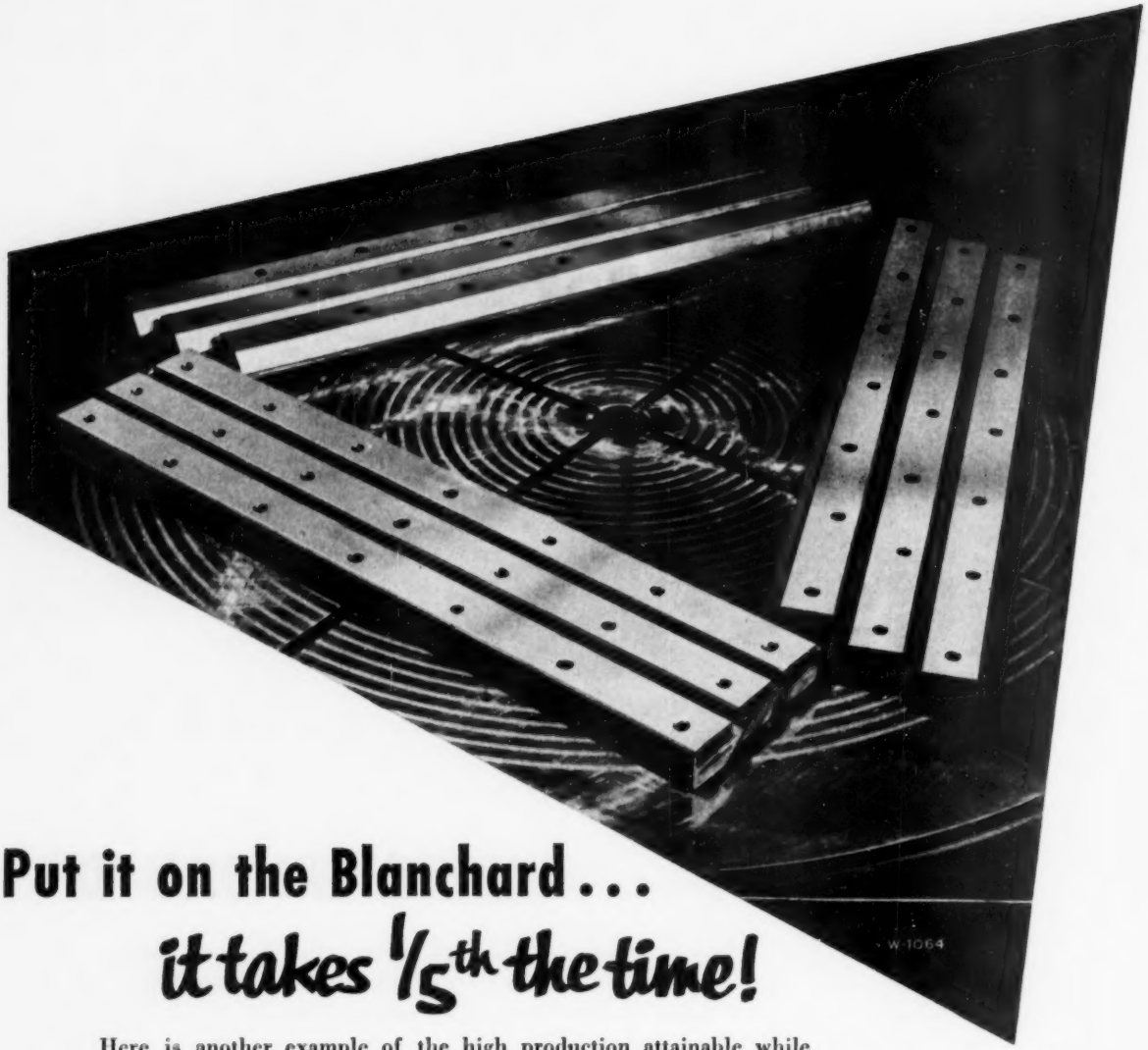
Speed-threading with unusual accuracy is nothing new for the Cri-Dan "D". But as the machine's reputation spreads, it is given tougher and tougher jobs to perform.

In this case it is threading an aircraft radial engine cylinder barrel with a 6-pitch, special buttress thread. Using a single point carbide tool and running at 200 RPM, the operation was completed in 10 passes requiring 50 seconds for the operation.

If you, too, have difficult threading jobs requiring speed as well as accuracy it will pay you to learn the facts about the Cri-Dan "D". For additional information get in touch with your Lees-Bradner representative—or write to us direct.

the LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.



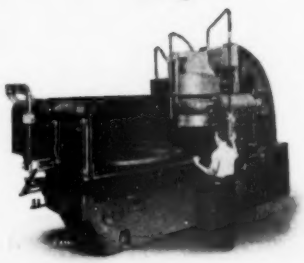
Put it on the Blanchard...
it takes 1/5th the time!

Here is another example of the high production attainable while grinding to extremely close tolerances with Blanchard Surface Grinders and Blanchard Wheels.

It formerly took 45 hours, floor-to-floor, to grind these nine hardened steel machine tool ways. They are 2½" x 3½" x 50" and hardened to Rockwell C-60-63.

Now, these highly desirable results are obtained, using a No. 42-72-84 Blanchard Surface Grinder — nine are placed on the chuck and ground on 6 sides, removing .015" from each surface, parallel to .0001", flat within .0001" with surface finish of 5 micro-inches. The Blanchard **cut time to 9 hours,** floor-to-floor!

No wonder production men say: "Put it on the Blanchard — it takes less time to do a better job".



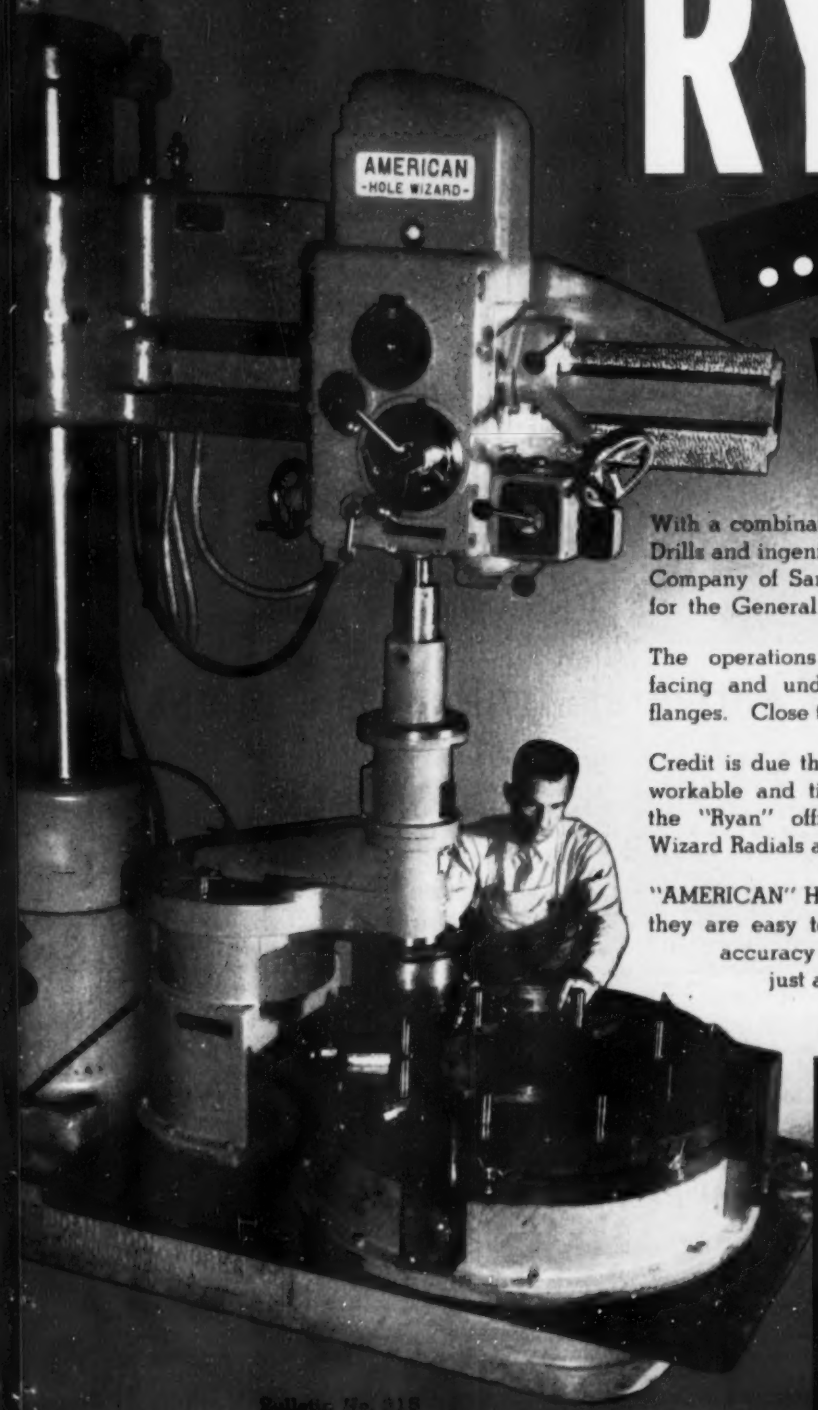
This is the largest Blanchard Surface Grinder, No. 42-72-84.

Send for your free copies of "Work Done on the Blanchard", fourth edition, and "Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

RYAN ...HITS THE JACKPOT!

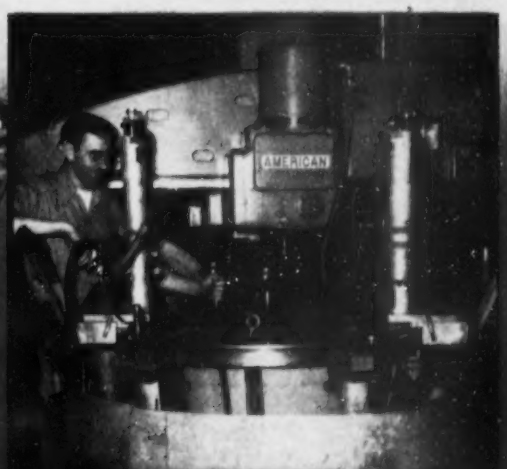


With a combination of "AMERICAN" Hole Wizard Radial Drills and ingeniously designed fixtures Ryan Aeronautical Company of San Diego, California, produces Aft Frames for the General Electric J-47 jet engine in record time.

The operations performed include precision boring, facing and undercutting of the stainless steel support flanges. Close tolerances must be and *are* held.

Credit is due the "Ryan" engineers for developing such workable and time saving fixtures. Credit is also due the "Ryan" officials for selecting "AMERICAN" Hole Wizard Radials as part of the "winning combination."

"AMERICAN" Hole Wizards are sturdy; they are powerful; they are easy to operate and they retain their original accuracy for years to come. For substantiation just ask the operator.



Bulletin No. 318
will give you the facts

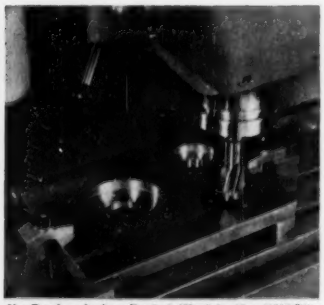
THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

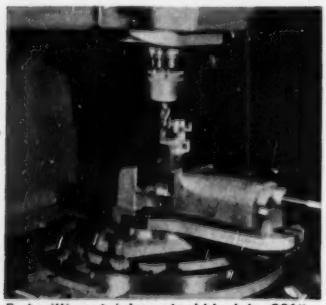
Boring operation on 24" aluminum microwave component. Note complicated set up made simple with HURTH tiltable worktable. Deep throat of machine saves set up time . . . saves cutters, too.

PHOTOGRAPHED AT L. H. TERPENING CO.

can you match these savings . . . in your boring and milling operations?



Jig Boring holes first drilled in the HURTH.



End milling stainless steel block to .001".

65% saving in set up and production time at RAYTHEON

"The HURTH V10a performs both jig boring and milling operations that would cost us three times as much on other type equipment. We find it flexible for short runs and equally reliable and consistent for long runs."

says Albert Waldstein, Mgr., Machine Design and Fabrication, RAYTHEON MANUFACTURING CO.

25-50% saving in toolroom and small lot production at TERPENING

"The HURTH V10a cut our jig boring and milling time up to 50% compared to equipment formerly used. It's the first machine we turn to for close-limit tooling and small lot production and it does work not possible on our other machines. In jig boring with the HURTH, we locate and size holes within .0002"."

says E. J. Friebele, Chief Engineer, L. H. TERPENING CO.

Both agree – as do all other HURTH users – that there's no precision tool so economical to run when complicated set ups with many tool changes are required. For the HURTH combines vertical milling, downfeed milling and jig boring in one machine – performs these *three different operations* to close tolerances with *one* set up of the work. You merely change table settings and cutting tools for:

VERTICAL MILLING – using longitudinal traverse of work table, which can be tilted 15° to front or rear.

DOWNFEED MILLING – using longitudinal traverse of worktable and graduated downfeed of cutting spindle.

JIG BORING – using continuous spindle downfeed, varied in extremely small steps.

Match the savings other HURTH users are getting – in your toolroom – on your production line. Talk it over with one of our sales engineers. Write for details.

Delivery from stock. Engineered servicing and stock parts from Orban Service Centers.

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KURT ORBAN COMPANY, INC.

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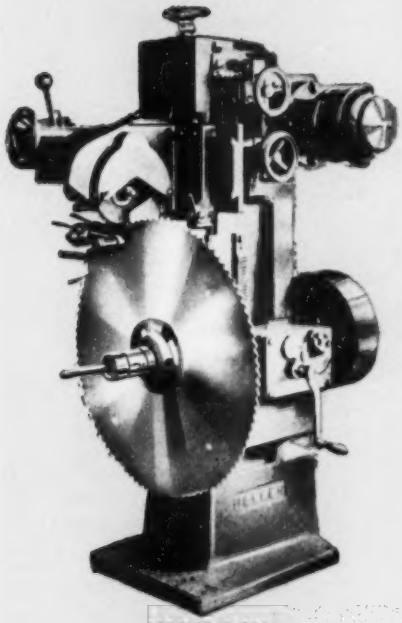
MODEL SSH-800-A
AUTOMATIC COLD METAL
SAWING MACHINE

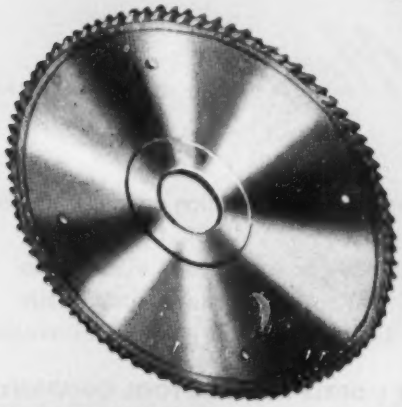


MODEL B-650
AUTOMATIC SAW SHARPENING
MACHINE

Cutting Costs and
Increasing Efficiency with

HELLER

COLD SAWING MACHINES
BLADE SHARPENING MACHINES
AND SAW BLADES



HELLER GIVES YOU COMPLETE SERVICE WITH
EXACTLY CORRECT BLADES.

Heller High Efficiency Cold Metal Sawing Machines are built in both manual and fully automatic types in machine sizes ranging from 3" bar capacity up to 48" billet capacity and blade sizes from 12" to 120" diameter. They are full hydraulic with completely centralized operating control. Illustration shows our SSH-800-A full automatic with bar capacity to 10" round stock.

The Model B-650 machine shown represents a new construction in arrangement and operating features. Using change gears and built-in dividing head, it insures a true tooth pitch and form and eliminates the use of a variety of master index plates for varying diameters and pitches of saw blades. Machine is rigidly constructed to secure extremely high grinding capacity and performance and produces a true and correct cutting tooth shape. Machines built in five sizes for 2½" to 120" diameter saw blades.

Importing Heller Machines Since 1926

HELLER MACHINE COMPANY, 114 Liberty St., New York 6, N. Y.

KNEE AND PLANER TYPE MILLING MACHINES • RADIAL AND COLUMN DRILLING MACHINES • TRANSFER MACHINES • SPECIAL MACHINES

get
a
better
job done

with

Mor-Speed

save time

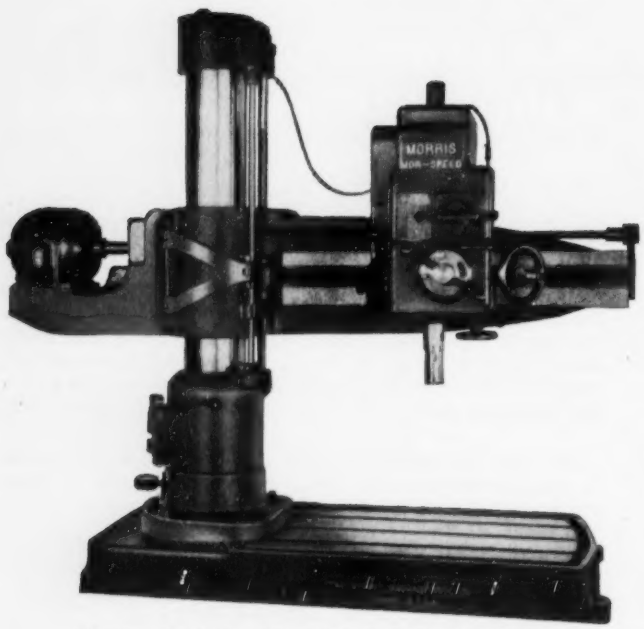
with completely centralized controls . . . instant selection of proper speed, feed; easily set automatic stops and trips.

with safety and dependability

tested safety devices safeguard machine, worker, workpiece . . . automatic lubrication protects built-in precision.

with lasting accuracy

alloy steels . . . modern hardening . . . extra anti-friction bearings, all assure minimum wear and low cost service.



9" Column Standard and Heavy Duty Models (with 3 and 4-foot arms)

11" Column Heavy Duty Model (with 3, 4, 5 and 6-foot arms)

Morris MOR-SPEED RADIALS

Whether for production or tooling MORRIS Mor-Speed RADIAL DRILLS give you fast, easy operation with accuracy so essential in holding down costs. Write for bulletin #59. Early deliveries available.

THE MORRIS MACHINE TOOL COMPANY
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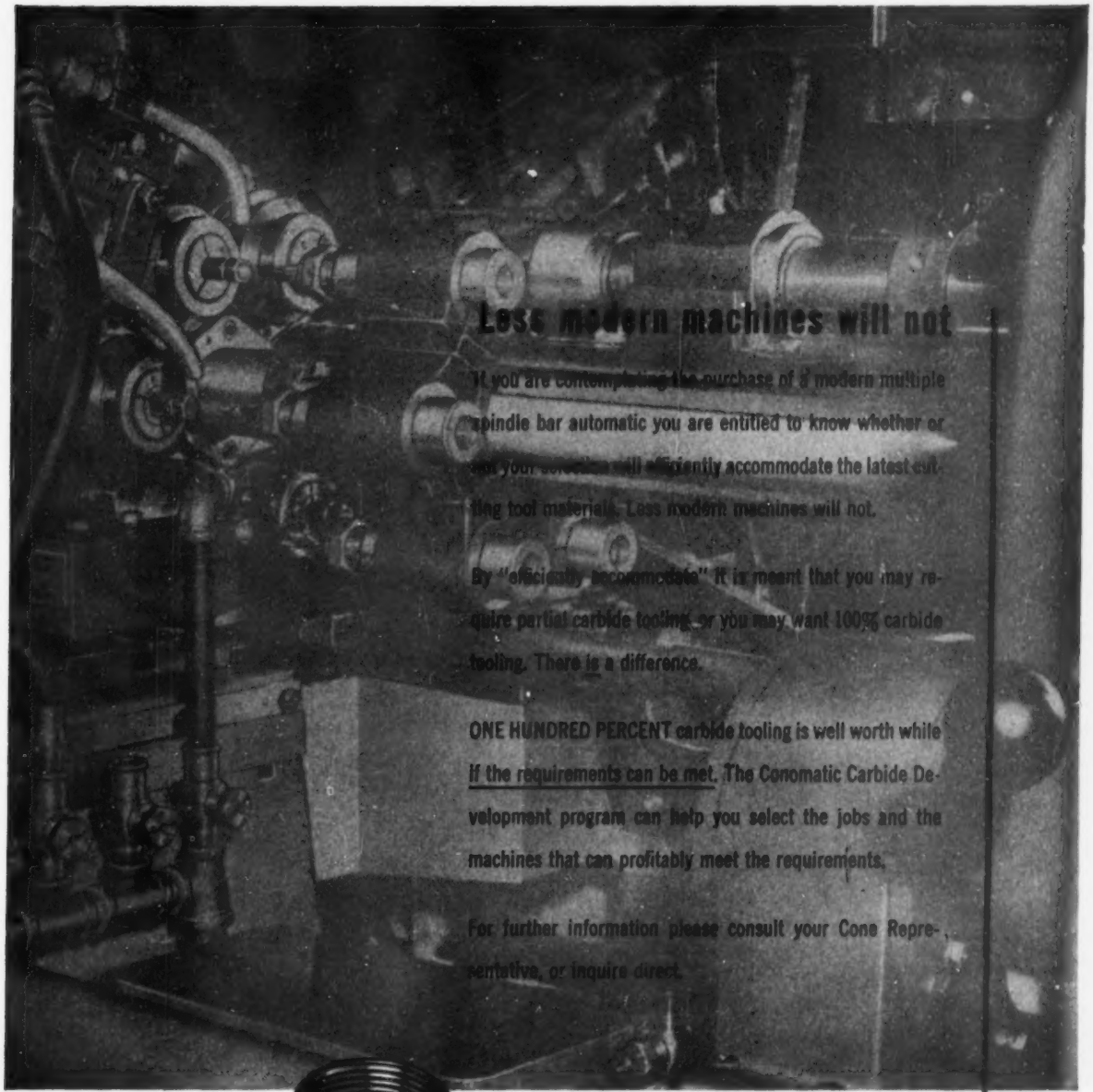
Morris

"A Better Product at Less Cost with PRECISION PLUS PRODUCTION."



Less modern machines will not

If you are contemplating the purchase of a modern multiple spindle bar automatic you are entitled to know whether or not your selection will efficiently accommodate the latest cutting tool materials. Less modern machines will not.

By "efficiently accommodate" it is meant that you may require partial carbide tooling or you may want 100% carbide tooling. There is a difference.

ONE HUNDRED PERCENT carbide tooling is well worth while if the requirements can be met. The Conomatic Carbide Development program can help you select the jobs and the machines that can profitably meet the requirements.

For further information please consult your Cone Representative, or inquire direct.

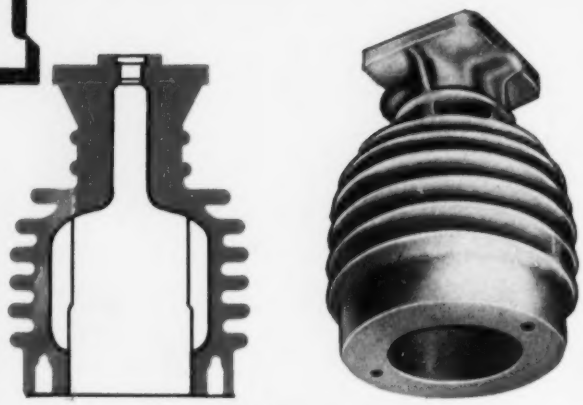
MATERIAL—1040 STEEL

	HSS	CARBIDE
Cycle Time	*	30 secs.
Work Spindle Speed	*	670 R.P.M. at 160 S.F.
Tool Wear	*	2000 pcs. per grind

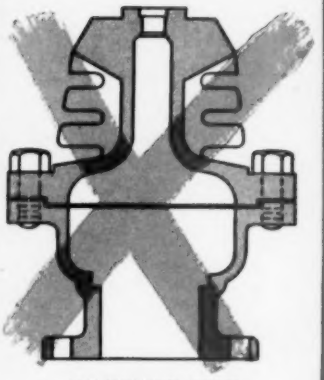
*Hot rolled material prevents fair comparison

Conomatic} CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

1 MEEHANITE® CASTING

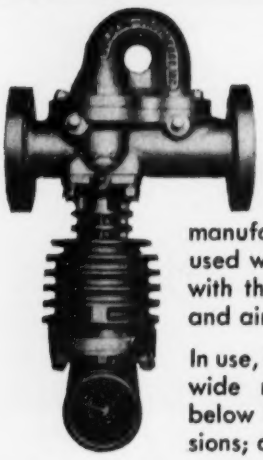


NEW ONE-PIECE MEEHANITE CASTING



OLD TWO-PIECE DESIGN

does the job of 2 BRONZE CASTINGS



Builders-Providence, Inc., Providence, Rhode Island, manufacture a "Shuntflo Meter" left, used widely in industry in connection with the measurement of steam, gas and air flow in pipe lines.

In use, these meters are subjected to a wide range of temperatures from below freezing up to 450° F; corrosions; and 300 psi pressures.

When redesigning the unit, the high strength and density of Meehanite metal insured more than adequate pressure tightness. Resistance to corrosive attack under varying temperatures was achieved by a special coating developed by the Glidden Company, Reading, Pennsylvania.

The old 2-piece design, the new design and the single Meehanite casting developed are shown above. Cost saving achieved was 60%.

Write for our new Bulletin #37—
"Proof That Meehanite Bridges the Gap Between Cast Iron and Steel"

MEEHANITE® **NEW ROCHELLE, N. Y.**

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Barnett Foundry & Machine Co.	Irvington and Dover, New Jersey
E. W. Bliss Co.	Hastings, Mich. and Toledo, O.
Builders Iron Foundry	Providence, Rhode Island
Compton Foundry	Compton, Calif.
Continental G.n Co.	Birmingham, Alabama
Crawford & Doherty Foundry Co.	Portland, Oregon
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Hardinge Company, Inc.	New York, New York
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London Concrete Machinery Co., Ltd. (Hartley Fdry)	Brantford, Ontario
E. Long Ltd.	Orillia, Ontario
Otis Elevator Co., Ltd.	Hamilton, Ontario
Palmyra Foundry Co., Inc.	Palmyra, New Jersey
The Henry Perkins Co.	Bridgewater, Massachusetts
Pohlman Foundry Co., Inc.	Buffalo, New York
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Standard Foundry Co.	Worcester, Massachusetts
The Stearns-Roger Manufacturing Co.	Denver, Colorado
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Valley Iron Works, Inc.	St. Paul, Minnesota
Warren Foundry & Pipe Corporation	Phillipsburg, New Jersey

"This advertisement sponsored by foundries listed above."

BAND TOOLS

DoALL

GAGE BLOCKS

PRODUCTION NEWS

SAW BANDS • GAGING EQUIPMENT • TOOL STEEL • CUTTING TOOLS • INDUSTRIAL SUPPLIES

Vol. 2 Published by the DoALL Company, 254 N. Laurel Ave., Des Plaines, Illinois No. 4

Mass Production Contour Grinding Proved on Power Steering Parts

DoALL Precision Surface Grinders Form Radii on Pump Vanes; Surface Finish 10 to 15 Micro-inches; Output 1150 Pieces Per Hour

The opportunities afforded by contour grinding (grinding a profile or contour on a part) are evidenced by its use in forming radii on the vanes used in hydraulic pumps for automotive power steering and brake mechanisms. These parts must be mass-produced to close tolerances with extremely accurate surface finishes (see job data below).

Contour grinding permits hardening of parts before machining, thereby eliminating distortion that might be caused by subsequent heat treating. It assures superior surface finish and accuracy, and provides low cost per piece. As a result, contour grinding warrants investigation as a method of machining many jobs now being done on milling, shaping, splining, slotting and similar machine tools.

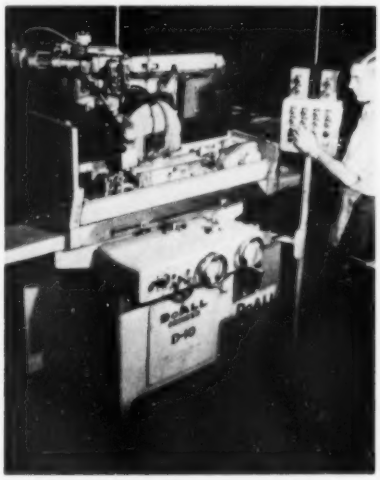
Requires Good Grinder

Contour grinding presents no difficult problems, nor is it difficult for any surface grinder operator to master. But, it does require a rigid, accurate grinder with a heavy duty spindle, slow table speeds and wheel crush dressing accessories. The loads imposed on the machine during crush dressing of the wheel are more than ten times as great as those imposed by straight surface grinding. Additionally, grinding of irregular contours creates axial as well as radial loads on the wheel and spindle.

DoALL automatic contour grinders meet the conditions imposed by the work. On straight surface grinding, DoALL Grinders will take exceptionally heavy cuts and go back through the cut without sparking. They will consistently duplicate directly from handwheel settings. The rigidity and accuracy which make this performance possible makes them ideal for contour grinding.

DoALL Lab Can Tell

Investigation of the feasibility of contour grinding will be handled by the DoALL Grinder Laboratory, a proving ground for any interested customer. It is necessary only to submit sample parts with drawings specifying the desired profile, tolerance and surface finish. A full report advising the performance possible on a production basis will be given. Requests may be made to local DoALL Sales-Service Stores or to The DoALL Company, Des Plaines, Ill.



Automatic contour grinder. Once the controls are set, grinder operates automatically until job is finished.

JOB DATA

OPERATION: Automatic contour grinding .09" (± .03") to form radii on power steering pump vanes.

MACHINE: DoALL Automatic Precision Surface Grinder.

PART SIZE: .6136" x .343" x .0775".

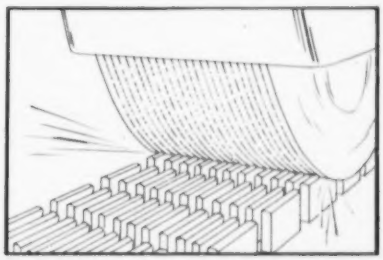
DOWNFEED: .0005" per pass.

TABLE SPEED: 40 fpm.

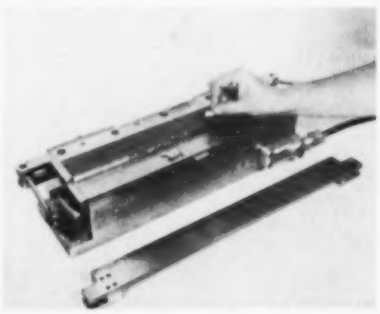
COOLING: Combination flood and "Cool-Grinding" with high detergent soluble oil.

PRODUCTION: 1150 pieces per hour.

SURFACE FINISH: 10 to 15 micro-inches RMS, free of checks or cracks.



GRINDING TO A PROFILE — The wheel is crush dressed to a profile to give the desired contour to the parts. Radii are precision ground on these tiny pump vanes at a rate of 1150 per hour.



Vanes are placed in rows on the magnetic chuck with spacer bars between the rows.

Toolmaker Tells The Story

In a national metalworking magazine article which appeared recently, a toolmaker bemoans the fact that too few machine tools or accessories are designed to repeat accurately. He finds one bright note in this statement, *"The right direction is shown by only one builder. His surface grinder spindle is the only one that does not give; there is no spark when the wheel is re-run over a previously ground job still on the chuck. Why? Because the spindle is three or four times as heavy as usual. Precision is put there to stay."*

Shop men who have used DoALL Grinders, or witnessed their demonstration, can name the grinder referred to above.

----See Next Page--→

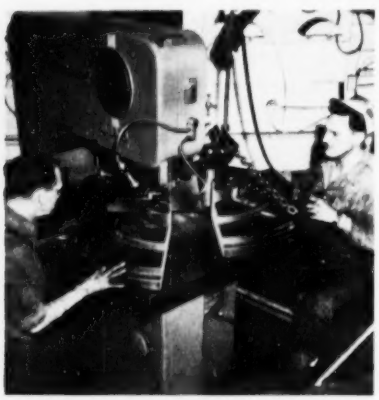
DoALL Claw Tooth Saw Band Cuts Faster and Lasts Longer on Nearly Every Application

Nearest Thing to "All-Purpose" Blade Ever Developed; Reduces Number of Blade Types Required by Most Users

Use of DoALL Claw Tooth saw band, first mass-produced successfully about a year ago, is increasing steadily as more and more users learn its capabilities on a wide range of jobs. This hard edged, flexible back band with positive rake angle teeth has already proved, within the limitations of its pitch selection, to be the closest thing to an all-purpose blade ever developed. It has been applied for cut-off and contour sawing of ferrous and non-ferrous metals, wood, plastics and other non-metallics. In most instances the cutting rate has been measurably greater than that of other blades, often remarkably greater. This is attributed to the claw-like tooth design which pulls itself into the work, creating a heavy, curled chip. In most cases life has also been appreciably greater than that of other types of blades.

Not only has Claw Tooth band been used on all makes of band sawing machines, but also short lengths have proved to be excellent power hacksaw blades.

In addition to the obvious advantages of faster cutting and longer blade life, the versatility of Claw Tooth has given many users the additional benefit of reducing the number of different types of saw bands required for efficient cutting of different classes of work.



CASTING CUT 6 TIMES FASTER WITH CLAW TOOTH — this 1200 pound circular casting was being cut at a rate of 7 inches in 10½ hours when Midway Machine Company, St. Paul, called on DoALL Twin Cities for help. Their recommended change to Claw Tooth blade resulted in a cutting rate of 4 inches per hour, six times the previous rate.

Claw Tooth saw band is available in 100 foot coils, packaged in DoALL patented "Strip-out" metal containers, or in cut and welded lengths to fit any machine. It is made in 2, 3, 4 and 6 pitches, ¼" to 1½" widths.

Case Studies

Three-to-one blade life. On #303 stainless rounds previous blades lasted 30 pieces. Claw Tooth blade was still operating after cutting 96 pieces (final life not reported).

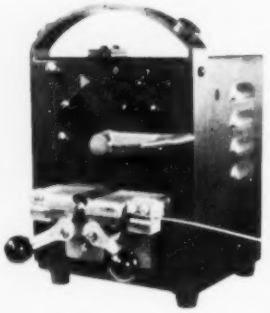
Cutting rate increased 75%. In trimming 24-ST shells, 3 ft. dia., 3/16" thick, DoALL Claw Tooth cut 75% faster than precision blade.

Cutting time reduced 33⅓%. In cutting off cold rolled flats 2" x 4" and rounds 2" to 6" dia., Claw Tooth not only reduced cutting time by one-third, but lasted two hours longer than previous blade.

70% less time to cut 2½" stainless. Cutting time with previously used 14-pitch precision type band was 15 minutes. DoALL 10-pitch Precision reduced this to 9 minutes, but Claw Tooth did the job in 4½ minutes.

Three times blade life on Fiberglas. Previous blade lasted twelve hours cutting 4" square blocks of ¾" thick Fiberglas. DoALL Claw Tooth lasts 40 hours and cuts twice as fast.

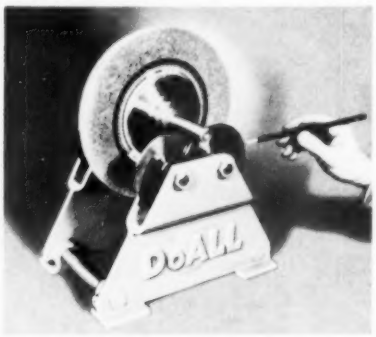
Saw Band Welder Applied to Wire



The illustration above shows the adaptation of a DoALL saw band butt welder to the welding of wire-tying wire used in the newspaper industry. The special wire guides on the welder jaws were developed by the American Newspaper Publishers Association Laboratories, Easton, Pa. By salvaging tail ends and partially expended rolls of wire by means of welding, wire waste has been reduced as much as 75%. This application suggests the possible usefulness of DoALL Welders for many wire and steel tape welding applications.

Free Wheel Balancer with DoALL Grinder

Much of the precision built into DoALL Surface Grinders is wasted if imperfectly balanced wheels are used on them. An unbalanced wheel will produce



ripple and rougher finish than is desirable on many jobs. To enable the user to secure maximum performance and superior finish, DoALL now provides with every new grinder, at no extra cost, a DoALL Wheel Balancer. This balancer is a simple, sturdy, accurate unit originally built to sell at $94.00.

Twin DoALLS Trim Pipe Covering

The unique installation pictured of two DoALL band machines trimming the ends of asbestos pipe covering is located at A. C. Wild Ltd., Toronto, Ontario. This production setup is safe, simple and efficient. Saw blade is ½" 6-pitch Precision type. Dust collectors back of each blade remove "chips".

DoALLS in 3-D

DoALL sales-servicemen are equipped to show full color stereo slides of DoALL band machines and precision surface grinders. A modern version of the old stereoptican viewer that Grandpa used makes the "show" fun to see.

New Low Cost Mechanical Comparator Speeds Inspection

A new mechanical comparator, the DoALL Producto-Chek, provides a simple, relatively inexpensive means for applying the advantageous comparator method of mass checking of finished parts and inspection of other gages. The comparator method of inspection is extremely accurate and rapid. Not only is it faster than checking with hand-held gages, it also eliminates the unreliable element of "feel". Deviations above and below a nominal size are indicated in the desired measurement units on an easy-to-read scale. No calculations or interpolations are necessary.

Three different gaging heads are available for the instrument, having ranges of .0001", .00005" or .000010". Metric scales are also available. These heads are quickly interchangeable.

Use of the instrument involves simply "zeroing-in" of the scale, a quick, simple three-step manual adjustment. After zeroing, parts are quickly placed in position under the spindle, checked and removed. The column can be rotated on the base to use the instrument with a surface plate or master flat.

The Producto-Chek is a rugged precision-built instrument that lacks none of the accuracy of far more expensive instruments. It is "frictionless" and has a unique double reed assembly for amplifying movement of the indicating needle. There are no gears, levers, racks or other mechanisms which would create play or backlash. "Repeatability" is excellent, the instrument consistently giving identical readings on the same piece under identical conditions.

Overall height is 19¼"; shipping weight 26 lbs. An accessory kit containing various anvils, tools and fixtures is available to extend the range of use of the Producto-Chek. Descriptive literature giving complete details is available upon request.

Bausch & Lomb Optical Instruments Now Available from DoALL Stores

Line Includes Contour Measuring Projector, Stereomicroscopes, Toolmaker's and Shop Microscopes and Others

The recent appointment of The DoALL Company as a national distributor of Bausch & Lomb optical instruments for quality control brings users the benefits of prompt assistance, information and free demonstrations from DoALL's own nationwide network of local DoALL sales-service stores. Factory-trained DoALL men, experienced in quality control and inspection problems and procedures, offer valuable know-how in the application of the B & L line.

The Bausch & Lomb instruments now being handled by DoALL include, among others:

3-D magnification with stereomicroscopes speeds assembly of small parts.

Contour Measuring Projector . . . projects parts images on a screen for comparisons accurate to .0001".

Stereomicroscopes . . . provide three-dimensional magnification for inspection and assembly.

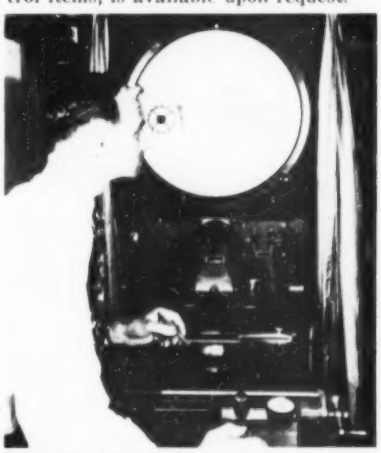
Toolmaker's Microscope . . . for examination and measuring of parts, including those too delicate to be subjected to mechanical inspection instruments.

Shop Microscope . . . a pocket unit for routine inspection for flaws, cracks, blowholes, irregularities, etc.

Brinell Microscope . . . for reading diameters of impressions made by hardness tester.

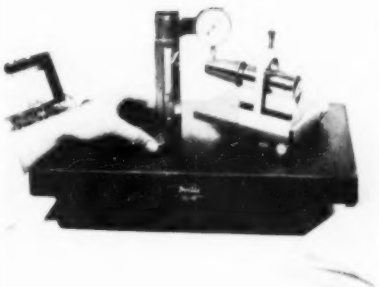
With the addition of B & L optical instruments, DoALL now offers industry one of the most extensive lines of inspection equipment available anywhere, including: DoALL gage blocks; the Micro-Step Gaging System; mechanical and electric comparators; monolights; optical flats; granite surface plates; sine bars; micrometers; calipers; thread, ring and plug gages; snap gages, and many other instruments.

Literature describing Bausch & Lomb Instruments or any other quality control items, is available upon request.



Enlarged, projected image of watch escapement on Contour Measuring Projector permits fast, accurate inspection.

DoALL Granite Surface Plates Outlast Iron and Cost Less



Longer life and lower cost are two of the reasons why industry is buying more and more granite surface plates for precision layout and inspection work. Other features in favor of granite include: freedom from warping; non-rusting; easily cleaned with soap and water or solvent; non-magnetic; rigid and distortion-free. Ultra-precision finishes up to 50 millionths are available. A complete range of sizes are available to meet any requirement.

DoALL will demonstrate a granite surface plate at any plant. Details and bulletin available upon request.

———See Next Page———→

DoALL Air Hardening Tool Steel Ups Tool and Die Life 50%

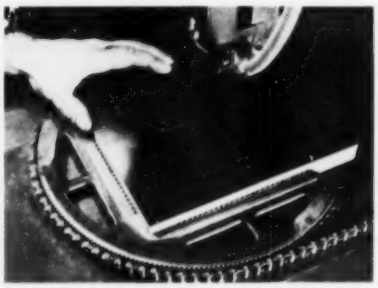
DoALL Air Hardening Precision Tool and Die Steel (ground flat stock) has a high chrome content (5%) combined with molybdenum and vanadium which makes it one of the most wear resistant tool steels available.

Job reports show that tools and dies made of Air Hardening steel produce up to 50% more pieces before requiring resharpening. Its high resistance to wear makes it ideal for use on silicon, stainless steel, monel metal and abrasive materials.

This steel can be heat treated to the desired hardness with practically no distortion and with a complete absence of heat treating cracks.

Like DoALL Oil Hardening stock, this steel is ground to a 25 micro inch RMS surface finish, ready for accurate layout.

DoALL Air Hardening Precision Tool and Die Steel is now available in over 100 standard sizes in stock at DoALL Sales-Service Stores. Special sizes can be supplied on short notice. A bulletin showing sizes is available upon request.



SAVES MACHINING TIME—Precision ground ready to use on the layout bench. Eliminates costly rough grinding of hot rolled tool steel to size. Easy to machine since it is uniformly and fully annealed. Free of decarburized surface and other surface defects.

DoALL "Has It In Stock"

As an entirely new service to industry, the DoALL Company has established a $1,000,000 central warehouse inventory of cutting tools, gaging equipment, tool steel and numerous metalworking necessities. Located in Des Plaines, Illinois, this inventory backs up sizable stocks on the shelves of 38 local sales-service stores throughout the country. Linked to these stores by teletype, the central warehouse can ship four out of five orders the same day they are received. Many specials and hard-to-get items are carried, as well as large quantities of standard products.

Tool-Saver Lubricant Lives Up to Name

DoALL Tool-Saver lubricant stick is an inexpensive easy-to-use product which greatly extends the life of saw bands, twist drills, taps and other tools on many jobs. A user in Tulsa sawing ¾" deep slots in 1" galvanized pipe was securing only 10 cuts per saw blade. Since applying Tool-Saver he averages 160 slots per blade. On drilling and tapping he has cut tool breakage 50% by using Tool-Saver.

CALL DoALL Locally at these Sales-Service Stores in United States, Canada and Mexico

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Birmingham 4—800 N. 24th St.
Call DoALL: Birmingham 3-0502

CALIFORNIA
Los Angeles 21—1316-18 S. Santa Fe
Call DoALL: Trinity 3871
San Diego—(Customer Service)
1017 First Street
Call DoALL: Main 8-2840
San Francisco 3—952 Howard St.
Call DoALL: Garfield 1-4784

COLORADO
Denver 4—1187 Stout St.
Call DoALL: Alpine 7444

CONNECTICUT
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Call DoALL: Hartford 3-6261

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Call DoALL: Charlotte 4-2579

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Milwaukee 5—2427 W. North Ave.
Call DoALL: Division 2-2950

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37 Clarkson Ave.
Call DoALL: Redfern 4238

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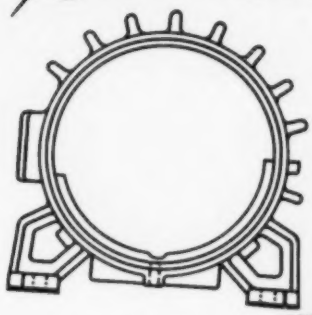

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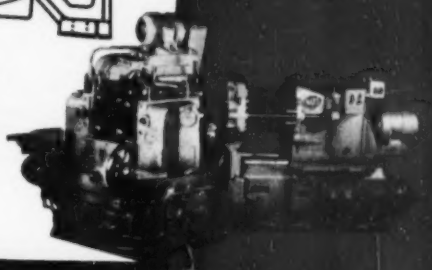

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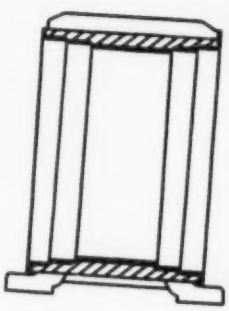

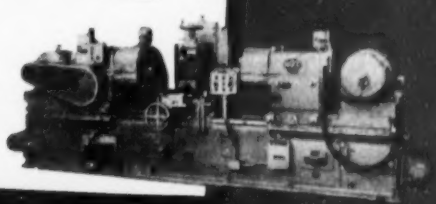

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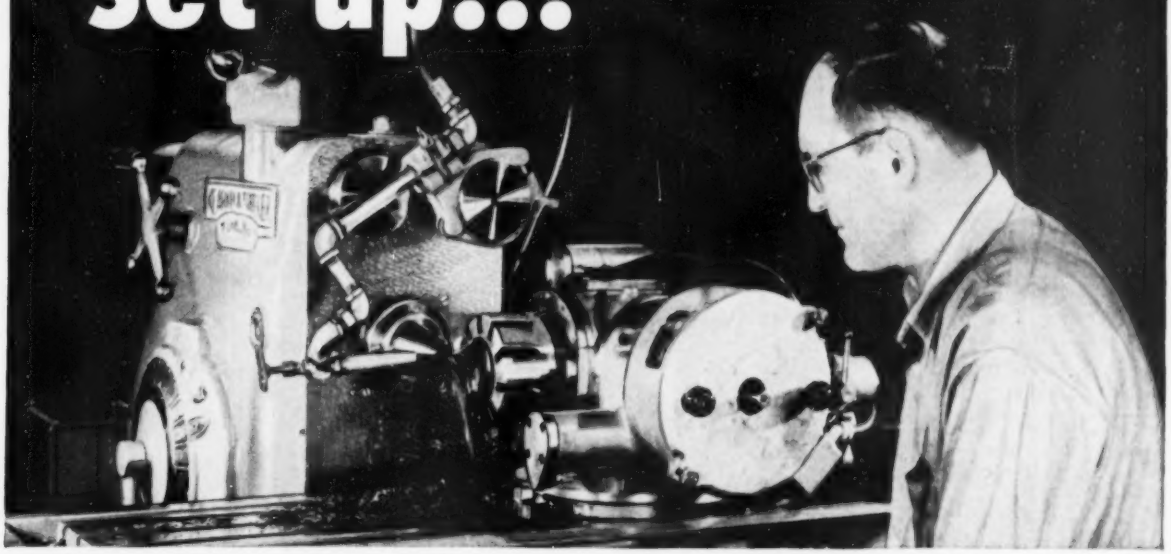

for the customer...it put a one-at-a-time indexing job on a production basis!

for the operator...only one motion controls entire indexing and milling operation!

THIS Universal Automatic Indexing Attachment, used in conjunction with the automatic cycle table movement on a Kearney & Trecker milling machine, eliminated a tedious dividing head job. A large midwest machine tool builder found this setup ideal for milling slots in face-milling cutter bodies.

CYCLE TIME CONSIDERABLY REDUCED . . . after each cut the table automatically retracts just enough to clear the cutter . . . attachment indexes automatically and next cut begins.

NOTCH PLATES CONTROL ACTUAL INDEXING . . . up to 24 divisions possible . . . plates changed in a matter of seconds . . . can be indexed two ways, automatically and manually.

ANY PRACTICAL ANGLE OBTAINABLE . . . workholding spindle housing can be swung 15° below horizontal and 15° beyond vertical (total 120° tilt). It swivels 140° about its vertical axis.

Request additional information on this versatile attachment.

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For complete details on this attachment . . . ask for *Data Sheet No. 1008*. Free booklet describing the facilities of the Special Machinery Division is also yours for the asking. WRITE TODAY TO SPECIAL MACHINERY DIVISION, KEARNEY & TRECKER CORP., 6784 W. NATIONAL AVE., MILWAUKEE 14, WISCONSIN.

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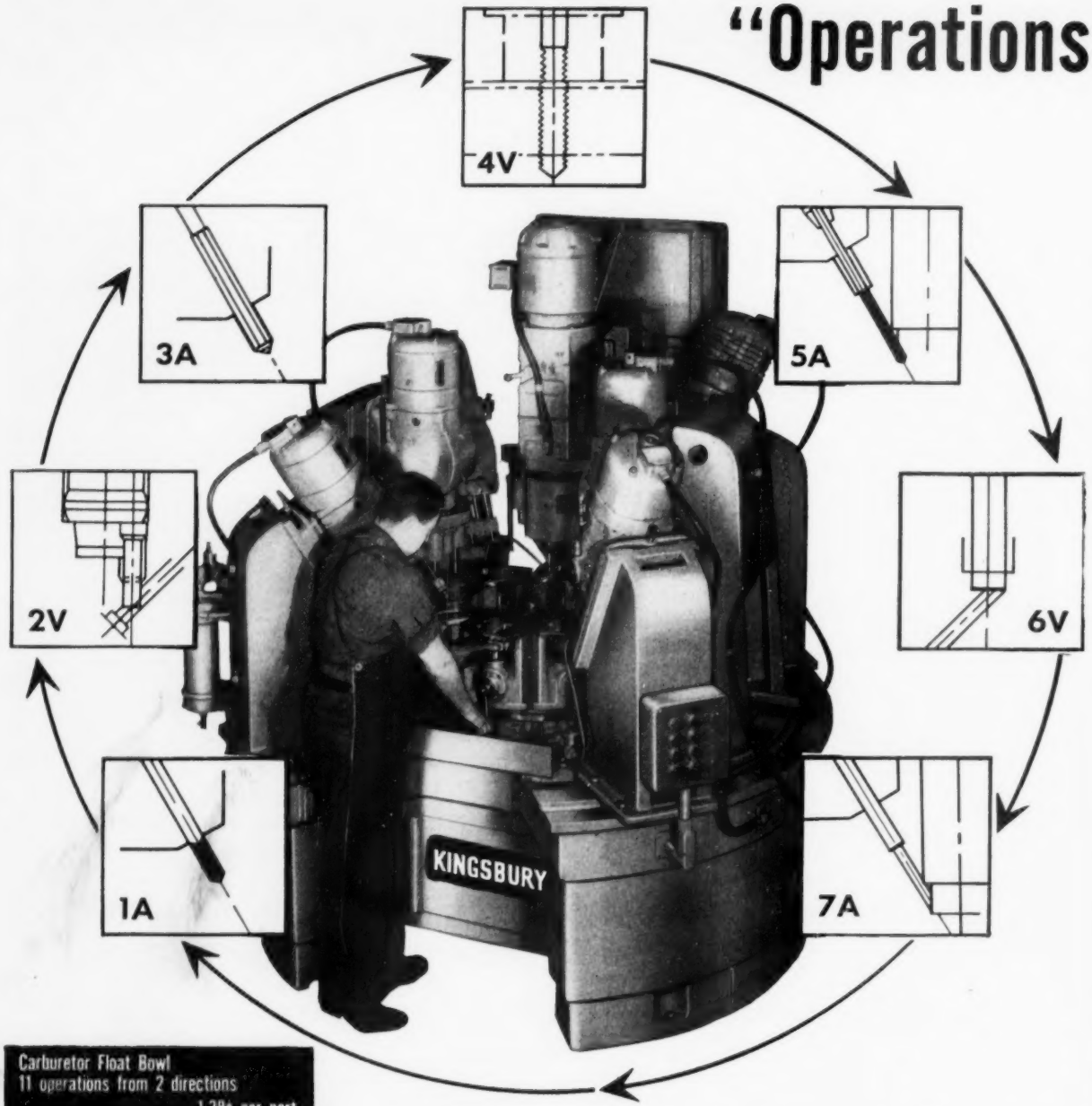
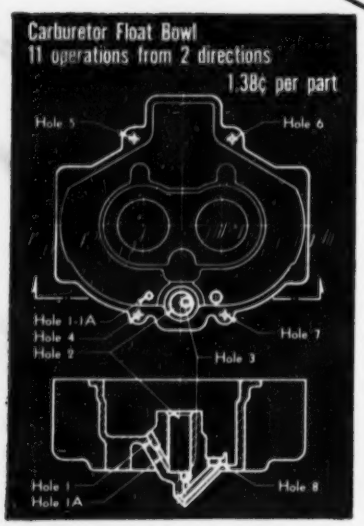
"Operations





Watch this Kingsbury drill, ream,

. . . at the rate of 55.9 operations every minute!

It works on a Carburetor Float Bowl (zinc-alloy die casting) operating on 7 vertical and 2 angular holes. It produces 305 parts per hour gross, at a cost of 1.38c per part.

This Kingsbury machine was custom-built to do a high production — low cost job on this particular piece. Four angle (A) and three vertical (V) units, operating 10 spindles, are mounted on a 60 inch base. Eight work fixtures (one for unloading and loading) are mounted on a 30 inch index turret, which indexes through the seven work stations in approximately 44 seconds. During this cycle the machine performs 11 precision operations, including broaching.

Let's follow through a work cycle — and remember this can go on day after day, year after year, producing accurate parts at low cost.

Kingsbury" all count up for profit

Let's look at these four machines

Combining operations makes it possible to perform more work in a given period of time.

On a Kingsbury Machine the tools at each station perform one or more of the required operations within a set time interval. The object is to perform all required work on the piece in one chucking within one cycle through the machine.

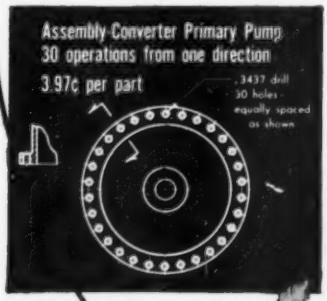
A single piece may be worked upon by different tools from several directions simultaneously. Everything except loading and unloading is controlled automatically — the machine takes over completely, carrying the work from station to station until the part is finished to specifications.

You save — because one machine does the work of several, with one operator, one chucking . . . and a high standard of accuracy that practically eliminates scrap loss. *You gain* through greater and more uniform output.

Kingsbury Machine Tool Corp.
104 Laurel Street, Keene, N. H.

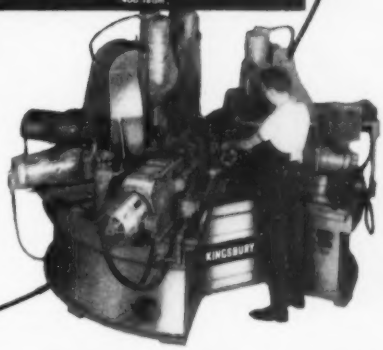
148.3 operations per minute

The machine drills, mills, end-mills, c'sinks and taps, at seven operational points. Seventeen tools function at six Kingsbury Units, mounted on a 60 inch base. The 30 inch index turret has eight work fixtures. Gross production 370 parts per hour.



51.0 operations per minute

The machine drills equally-spaced holes in a bolt circle slightly over 12 inches diameter. One vertical Kingsbury Unit with multiple spindle head operates 6 drills. The work fixture indexes five times to produce 30 holes — then moves to free the work for unloading and loading. Gross production 102 parts per hour.



63.3 operations per minute

The machine drills, reams, c'sinks and taps at eight operational points. Eighteen tools function at seven Kingsbury Units mounted on a 100 inch base. The 20 inch index turret has eight work fixtures. Gross production 211 parts per hour.

seat, burnish, broach and tap

Unit 1A .136 drills Hole 1 at 60° angle, 7/8 inch deep.

Unit 2V operates on cored Holes 2 and 3. It has a combination burnishing and broaching tool attached to the quill of the drill head. Spindle is eliminated. Feed mechanism of drill head forces tool downward. It .625 burnishes Hole 2 to a depth of 1 inch and .125 broaches Hole 3 to a depth of 3/8 inch. Hole 3 is located .1875 off center line of Hole 2.

Unit 3A .1375 reams Hole 1.

Unit 4V has a four spindle auxiliary drill head; taps Holes 4, 5, 6, 7 (10-32 NF Taps).

Unit 5A .057 drills Hole 1-A at same 60° angle, 5/8 inch deep.

Unit 6V .250 burrs intersecting hole at bottom of Hole 8.

Unit 7V .136 burrs flat bottom seat in Hole 1.

One operator loads and unloads.

Each Unit Cost on the drawings includes the cost of the man and of the machine — no power or overhead. We assumed:

Unit cost of man equal to:

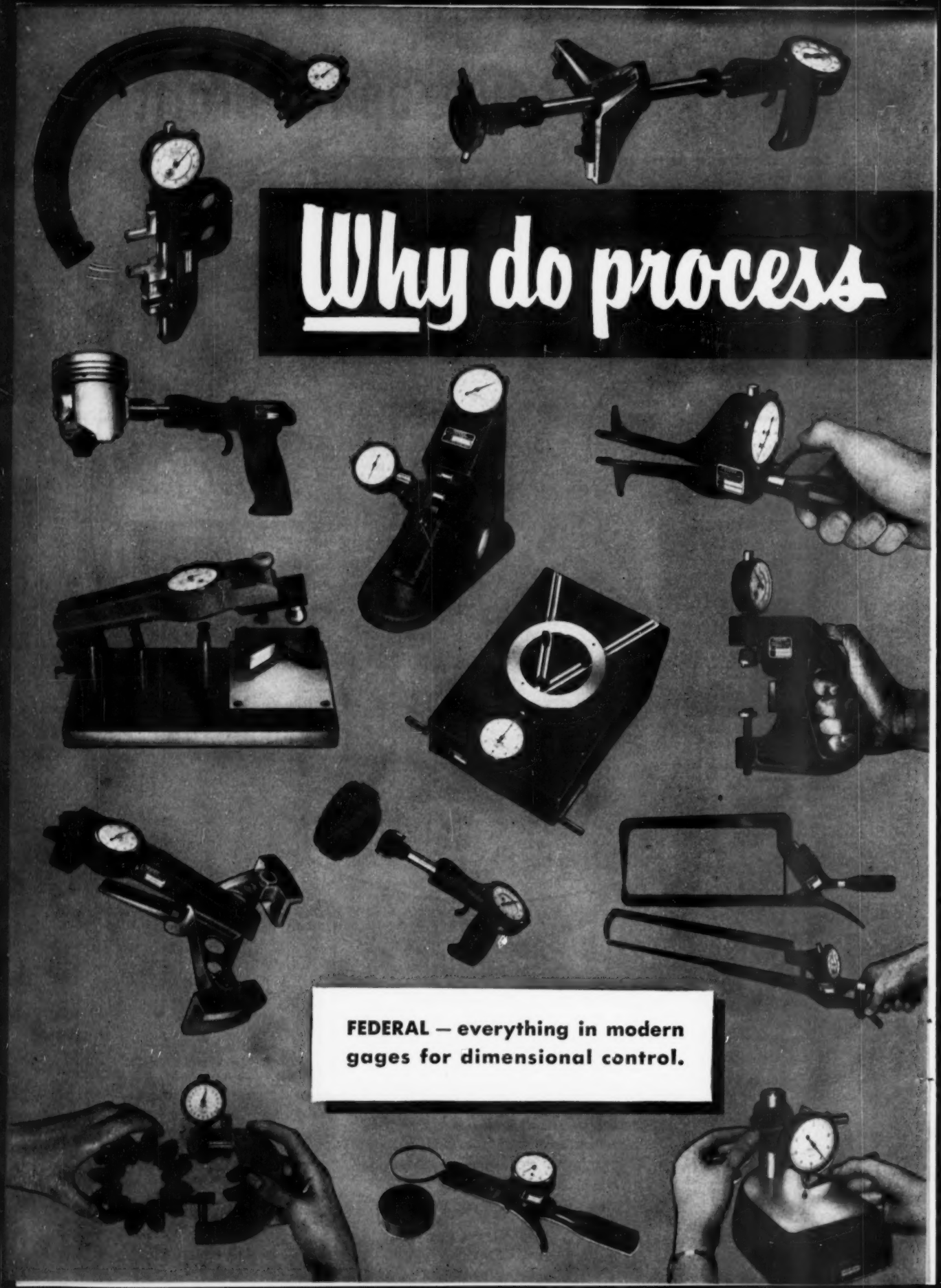
$$\frac{\text{average U. S. hourly wage}}{\text{hourly gross x 80\% eff.}}$$

Unit cost of machine to be:

$$\frac{\text{price of tooled machine}}{\text{output in 6000 hrs. @ 80\% eff.}}$$

KINGSBURY

AUTOMATIC DRILLING AND TAPPING MACHINES
for Low-Cost High Production


Why do process
FEDERAL — everything in modern gages for dimensional control.

engineers do it?

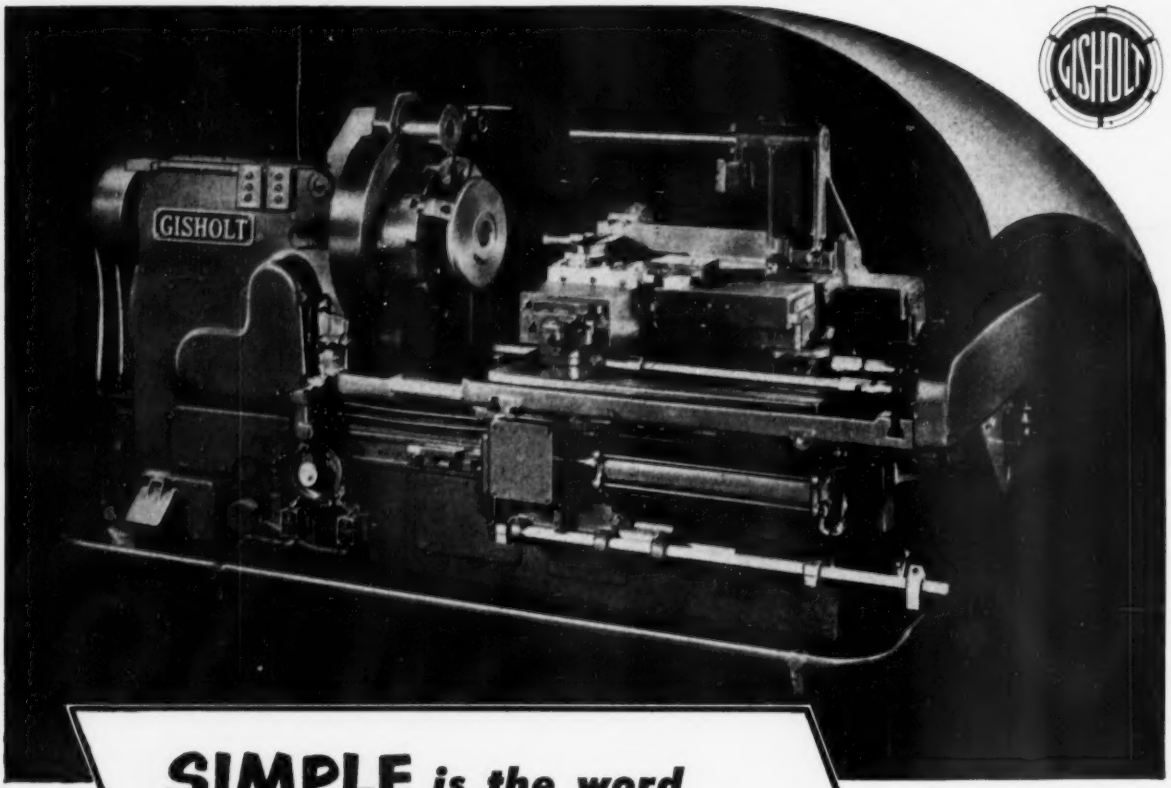
Again and again we learn where process engineers and gage engineers order gages *specially* designed and built when a Federal Catalog Gage, as is, or with slight modification, will perform as well and usually better. We've seen many such gages which were specially designed and specially built which are almost duplicates of gages already in our catalog. In one instance, the gage could have been readily obtained by adapting a Federal stock catalog gage (price $147.00) plus a modest charge ($45.00) for modifying it to the specific use.—What was the cost of the special gage? —$432.00!—That, my friend, is more than twice the cost of the modified Federal Gage.

Federal Gages are already *designed* . . . probably *built* . . . and the practicality of their design has been proved through years on the job. On the other hand, the special gages you design and build are expensive and almost certain to have unforeseeable "bugs" which run their costs up even more.

When you need a gage, it's only good judgment to investigate and see if a stock gage of proved efficiency can be modified to suit your requirements. We've had a lot of gage experience and we'll be glad to put it to work for you. Before you start specifying special gages, let us know what your process sheets require and we'll see what Federal Gages can be modified to do the job. You'll save *money*, and you'll save *time*. Just give us the details. Federal Products Corporation, 1211 Eddy Street, Providence 1, R. I.

FEDERAL

Largest manufacturer devoted exclusively to designing and manufacturing *all types* of DIMENSIONAL *INDICATING* GAGES

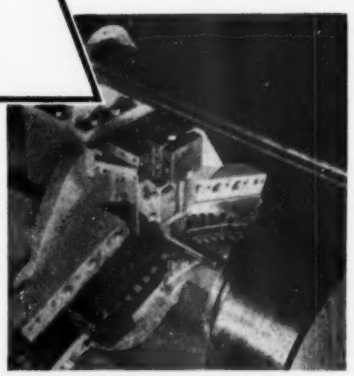


SIMPLE *is the word for the* SIMPLIMATIC!

Wherever you have a sufficient run of similar parts, the Simplimatic Automatic Lathe can solve several of your problems at once.

1. High speed production assures larger output at lower cost per piece.
2. The wide variety of tool arrangements on the large, flat table of the *Platen Type* Simplimatic (shown above) makes it adaptable to a wide range of work.
3. Training time is reduced to a minimum because the entire machining cycle is completely automatic. One operator normally runs several Simplimatics.

The extreme flexibility of the standard Simplimatic can frequently give you all the advantages of a machine designed especially for your job. If you want simple, quick, lower cost production, this is a good time to investigate the Gisholt Simplimatics. Ask for literature.

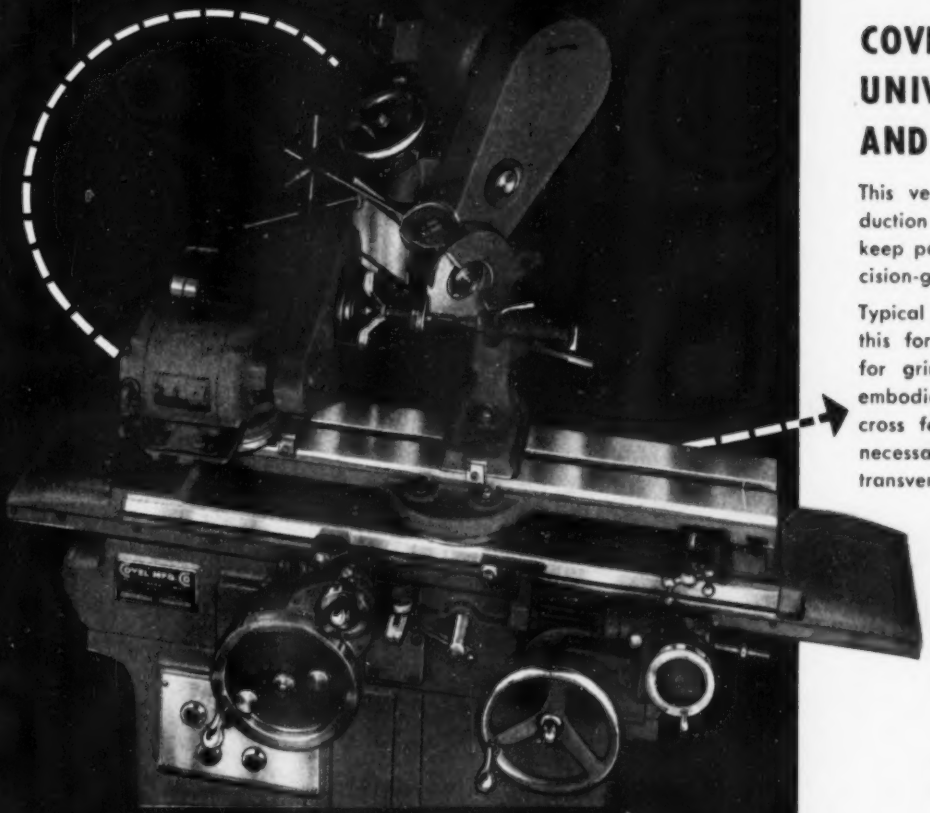


The *Radial Type* Simplimatic is ideal for machining flywheels, etc., with wide faces and multiple inside and outside diameters. Extreme rigidity permits multiple tooling and maximum cutting speeds, sustained accuracy and excellent life of cutting tools.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

TURRET LATHES · AUTOMATIC LATHES · SUPERFINISHERS · BALANCERS · SPECIAL MACHINES



COVEL NO. 12 UNIVERSAL CUTTER AND TOOL GRINDER

This versatile machine can get production off to a flying start — and keep pace with a steady flow of precision-ground, highly efficient tools.

Typical of No. 12's *universal* scope is this form grinding attachment set-up for grinding circular form tools. It embodies fine longitudinal feed—fine cross feed; for the extreme accuracy necessary for both longitudinal and transverse movement.

Write for
12-page detailed
Bulletin A-243

PRODUCTION *Starts* IN THE TOOL ROOM

Look to your tool room — where production starts — and see whether your tool-makers and set-up men are hampered by obsolete, inaccurate and wasteful grinding equipment. Poorly ground tools and cutters handicap production every step of the way — through inferior results, costly rejects, loss of valuable time, expensive tool waste.

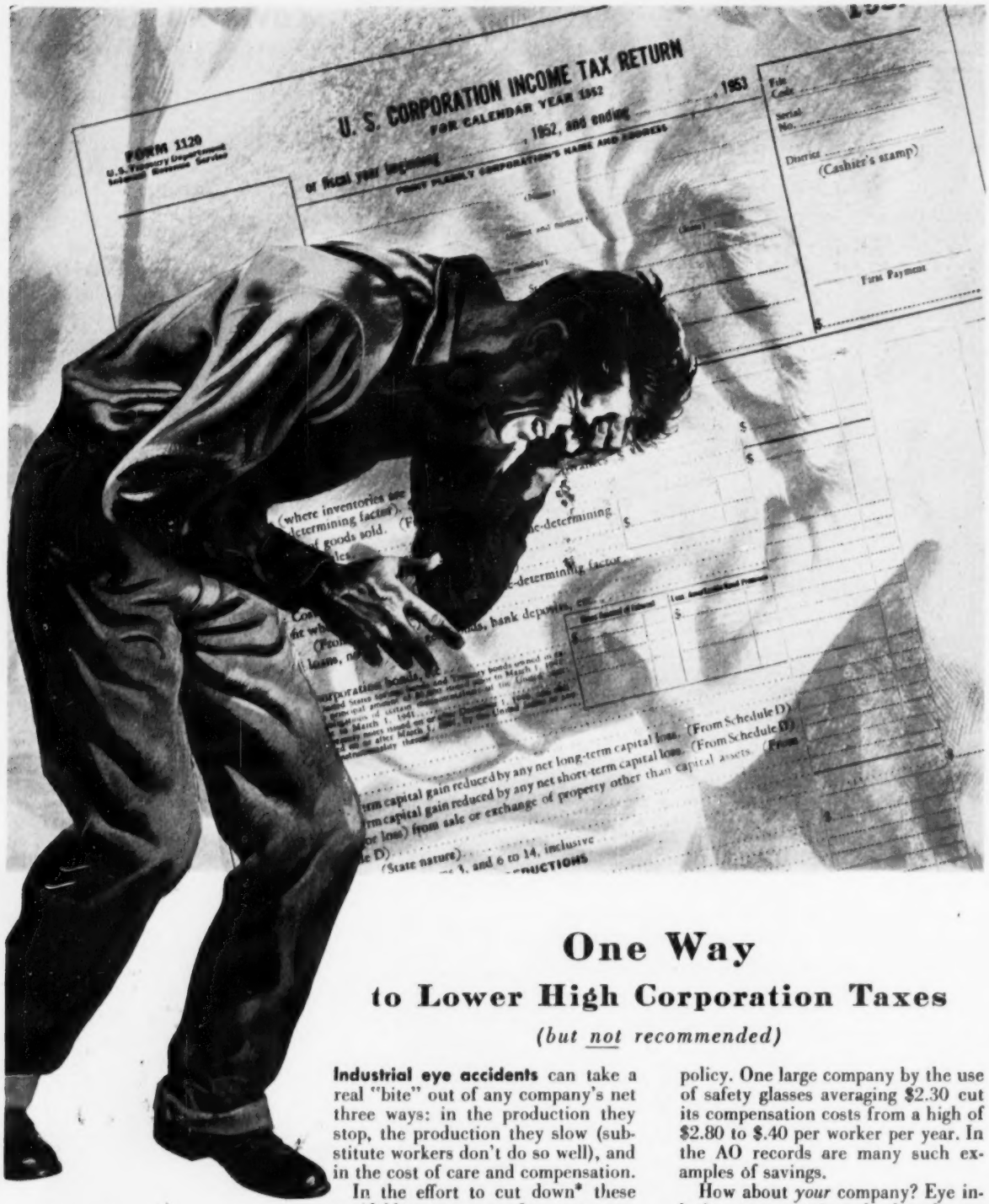
If your cutter and tool costs *are* high, perhaps you are *paying* for Covel quality without enjoying its many profit-saving advantages . . . and if so, now is the time to call on Covel for the answer. We will be pleased to send complete information.

80 YEARS of continuous manufacturing experience makes your COVEL choice a sound one

COVEL PRECISION GRINDERS

BENTON HARBOR, MICHIGAN

DRILL GRINDERS • UNIVERSAL CUTTER & TOOL GRINDERS • HYDRAULIC & HAND FEED SURFACE GRINDERS



One Way
to Lower High Corporation Taxes
(but not recommended)

Industrial eye accidents can take a real "bite" out of any company's net three ways: in the production they stop, the production they slow (substitute workers don't do so well), and in the cost of care and compensation.

In the effort to cut down* these avoidable taxes on profits, a program that safeguards a valued worker's eyes is sound policy. One large company by the use of safety glasses averaging $2.30 cut its compensation costs from a high of $2.80 to $.40 per worker per year. In the AO records are many such examples of savings.

How about *your* company? Eye injuries are as *certain* as death and taxes unless there is a program that controls them. Ask your AO Safety Representative for complete details.

"Stay in the Safety Zone with AO Safety Equipment"

American Optical
SAFETY PRODUCTS DIVISION

*98% of eye injuries are eliminated when workers wear safety goggles.

AO's Industrial Vision Program Increases Production, Decreases Accidents. Write today for booklet "Improved Industrial Vision" to American Optical Company, 51311 Vision Park, Southbridge, Mass.

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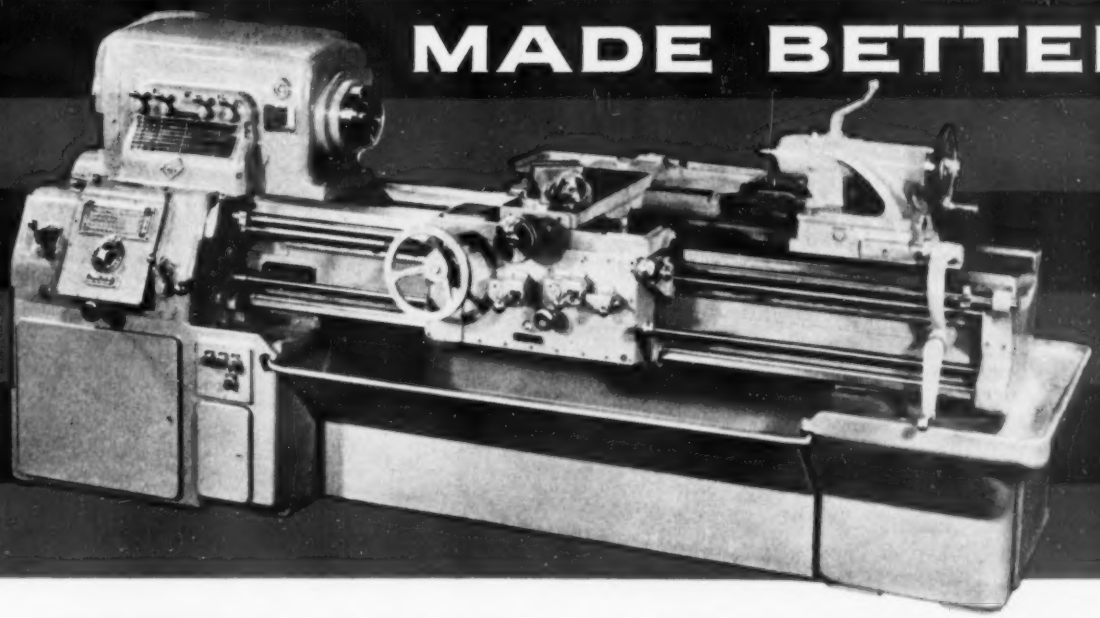
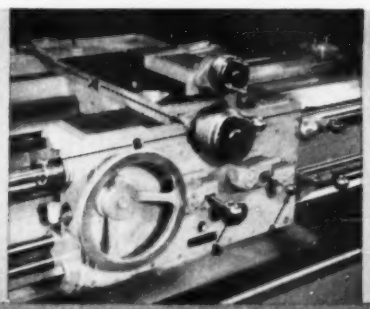
SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

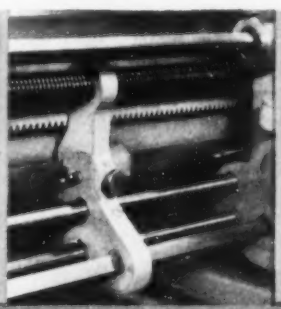
A GREAT LATHE MADE BETTER



TURNING TIME takes a tremendous beating from the 4-way power rapid traverse to both carriage and cross-slide—the feature that distinguishes the new Monarch Series 61 Lathe line. There's nothing like it for rapid tool positioning, for quick tool retraction, for fast carriage return, for greater productivity! As far as most specifications go, the Series 61 is identical with the great Monarch Series 60 line—coming in 13", 16", 20" and plus-swings—in Engine and Toolmaker's models—supplemented with a wide choice of accessory equipment. Power, accuracy, versatility and dependability, plus! But if it's souped-up output that you want—find out today what a small added investment in the Series 61's 4-way rapid power traverse can do for you! Send the coupon for full information . . . *The Monarch Machine Tool Company, Sidney, Ohio.*



INSTANT, EASY CONTROL! Movement of longitudinal friction lever right or left actuates instant rapid traverse in direction of movement. Downward motion engages feed. Cross feed friction lever gives similar action to cross slide. Quick—easy—a great time-saver.



BRIGHT IDEA! Long bed Series 61 models boast these unique new traveling rod supports for leadscrew reverse rod, leadscrew, feed rod, traverse rod and control rod. Without attention on part of operator, they're carried along—then re-positioned—as carriage travels.

Monarch

ACCURACY • ECONOMY • LONG LIFE

TURNING MACHINES

FOR A GOOD TURN FASTER—TURN TO MONARCH

THE MONARCH MACHINE TOOL COMPANY, Sidney, Ohio

Please send me without obligation your Booklet describing your Series 61 Lathes.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

"Indispensable for Tool Rooms
and for Production Departments
when
Extreme Accuracy is required"

LATHES • MILLING MACHINES • CHUCKING MACHINES • SECOND OPERATION MACHINES

The trend is to more deep drawn stampings with BLISS presses

74%

of presses at Transue & Williams are BLISS-built!

As specialists in deep drawn parts, Transue & Williams of Alliance, Ohio, require dependable and specialized production facilities to make full use of their widely-recognized designing ability. So it's significant that they depend largely on Bliss for presses.

Of the 35 presses in the T & W shop, 26—or 74%—are Bliss-built. And practically all the larger presses, including a new 650-ton draw press, are of Bliss manufacture.

Transue & Williams average nearly 200 deep draws an hour on their Bliss presses. For *extremely deep* draws, they find that a particularly valuable feature of these presses is the combination of hydro-pneumatic die cushion and positive knockout in the bed.

The outstanding advantages Transue & Williams get in Bliss drawing presses result from Bliss' long experience in building this type of equipment. *Whatever* type of press you need, why not call in a Bliss engineer? You'll find that Bliss builds it—and builds it better.

Bliss 650-Ton Single-Crank Toggle Drawing Press, latest addition to Transue & Williams' press room, is producing deep drawn stampings at rate of five strokes per minute.

E. W. BLISS COMPANY, CANTON, OHIO
E. W. Bliss (England) Ltd., Derby, England
E. W. Bliss Company (Paris), St. Ouen sur Seine, France
PRESSES, ROLLING MILLS, SPECIAL MACHINERY
U. S. plants at Canton, Salem, Toledo, Ohio; and Hastings, Michigan
Branch offices in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo; and Toronto, Canada. West Coast Representatives: Moore Machinery Co., Los Angeles and San Francisco; Star Machinery Company, Seattle. Other dealers in United States cities and throughout the world.

BLISS

ON YOUR PRESS IS MORE THAN A NAME...IT'S A GUARANTEE!

Wonder chemical

CHANGES METAL SURFACES, MAKES PAINTED PRODUCTS *look better longer*

NOT ALL "wonder chemicals" are new! Here's one that for more than a score of years has been doing a job that manufacturers at first said couldn't be done.

In as little as sixty seconds, Bonderite changes the surface of metal parts to a *nonmetallic* layer of unusual properties. Bonderite is used on automobile bodies, refrigerator cabinets, transformers, hardware, and metal furniture, to name a few items out of thousands.

This nonmetallic coating does several amazing things. Because it has an affinity for organic coatings and is integral with the metal, it takes and holds paint securely, preventing chipping and peeling. It acts to keep moisture from reaching the metal, thus controlling rust and corrosion. And should the paint film be damaged by accidental scratch or dent, Bonderite prevents the spread of finish failure.

All of these benefits combine to mean lasting fine appearance for those thousands of products whose manufacturers use Bonderite before painting.

Unlike many "wonder chemicals," Bonderite requires no special handling. It produces excellent results in large and small installations, in spray and immersion applications, and on steel, aluminum, zinc, or cadmium and their alloys.

The cost of Bonderite is small—a fraction of a cent per square foot of area treated—and the benefits are great.

Your inquiry will get prompt, expert, helpful attention.

*Bonderite, Bonderlube, Parco, Parco Lubrite — Reg. U.S. Pat. Off.

Parker

RUST PROOF COMPANY

2196 East Milwaukee, Detroit 11, Michigan

BONDERITE	BONDERITE and BONDERLUBE	PARCO COMPOUND	PARCO LUBRITE
corrosion resistant paint base	aids in cold forming of metals	rust resistant	wear resistant for friction surfaces

Now for the first time in a

LIGHT-HEAVYWEIGHT

SPEEDS FROM 50-4500 S. F. M.

with the new

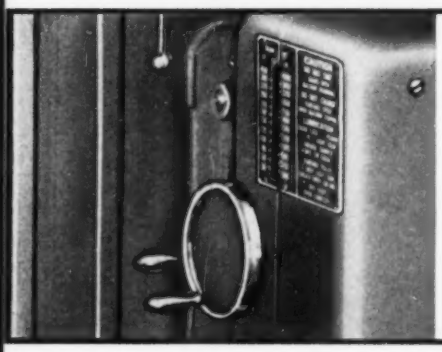
WALKER-TURNER 16" BAND SAW

You just dial the exact speed you want for a specific job — *while the machine is running.*

Newest of the Walker-Turner *light-heavyweights*, this 16" Band Saw features a Variable Speed Drive. Handles hundreds of cutting jobs — from tool steel to plastics — requiring varying rates of blade speeds. Infinitely variable speeds — from 50-4500 S.F.M. — are controlled by a hand wheel. No time "lost" changing belts or pulleys. Blade speeds are shown on a graduated scale.

In addition to the new Variable Speed Drive this new band saw features improved saw guides, quick change tires and an all new base. It's a versatile precision tool designed to set new performance records in your plant. Put it to work . . . and save.

For complete information on the new 16" Band Saw and other cost-cutting *light-heavyweights* call in your local factory-trained Walker-Turner distributor, or mail the coupon.



Quick-change Variable Speed Drive

A turn of the hand wheel gives the exact speed desired for any cutting job — from 50-4500 S.F.M. — while the saw is running. No "lost" time changing belts or pulleys.

Features that give you the most for your machine dollar!

CAPACITY: Blade to frame 16". Upper guide to table, max. 8".

SPEEDS: Infinitely variable, 50-4500 S.F.M.

FRAME: Three-piece frame and body construction for greater rigidity, accuracy and smoother operation.

BEARINGS: 6 Heavy duty precision ball bearings.

WHEELS: Dynamically balanced, rubber faced. Quick change tires standard equipment.

TABLE: Cast iron 18" x 17", carefully machined with ¾" x ⅜" miter gauge slot. Tilts to 45°.

GUIDES: Improved upper and lower leaf-type with ball-bearing rollers.

GUARDS: Cast aluminum doors cover wheels. Blade fully protected.

ACCESSORIES AVAILABLE:

AUTOMATIC POWER FEED: For cutting straight or irregular pieces. Unique clutch mechanism prevents overloading, prolongs blade life.

WELDING UNIT: For blades to ¼" wide. Available for operation on 110 or 220 volt A.C. Self contained grinder for removing flash.

SOLD THROUGH *FACTORY-TRAINED* INDUSTRIAL DISTRIBUTORS

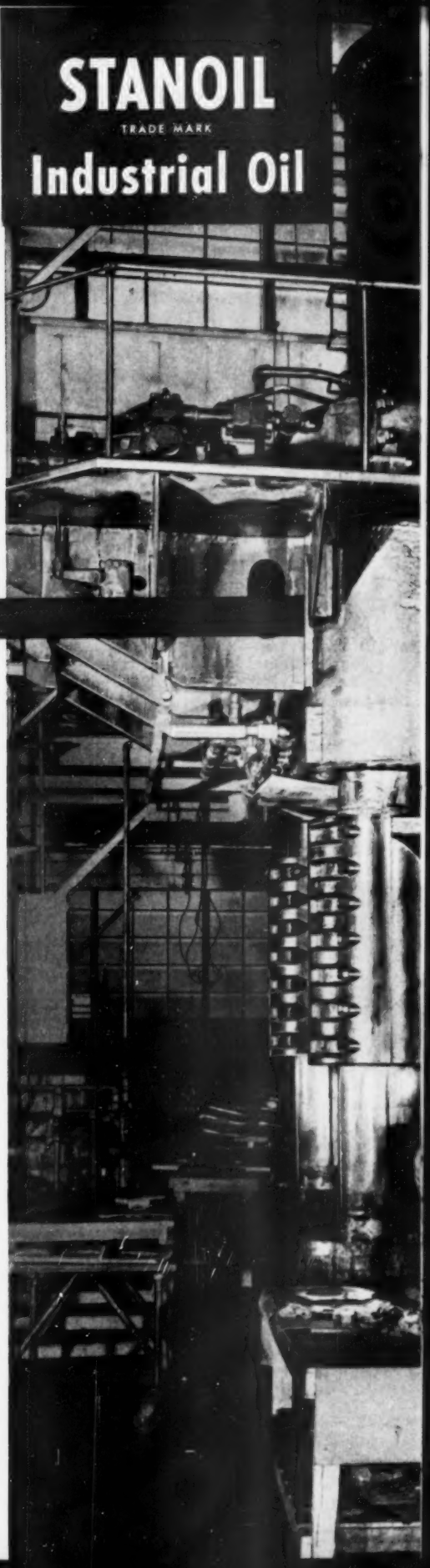
WALKER-TURNER
Walker-Turner DIVISION
KEARNEY AND TRECKER CORPORATION
PLAINFIELD, N. J.

Drill Presses — Hand and Power Feed • Radial Drills
Wood and Metal Cutting Band Saws • Tilting Arbor Saws
Radial Saws • Jig Saws • Lathes • Spindle Shapers
Jointers • Belt and Disc Surfacers • Flexible Shaft Machines

-----Use this space-------

To send for full details and specifications
Walker-Turner Division, Kearney & Trecker Corp.
Dept. AM 11, Plainfield, N. J.

How they keep hydraulic maintenance to a minimum



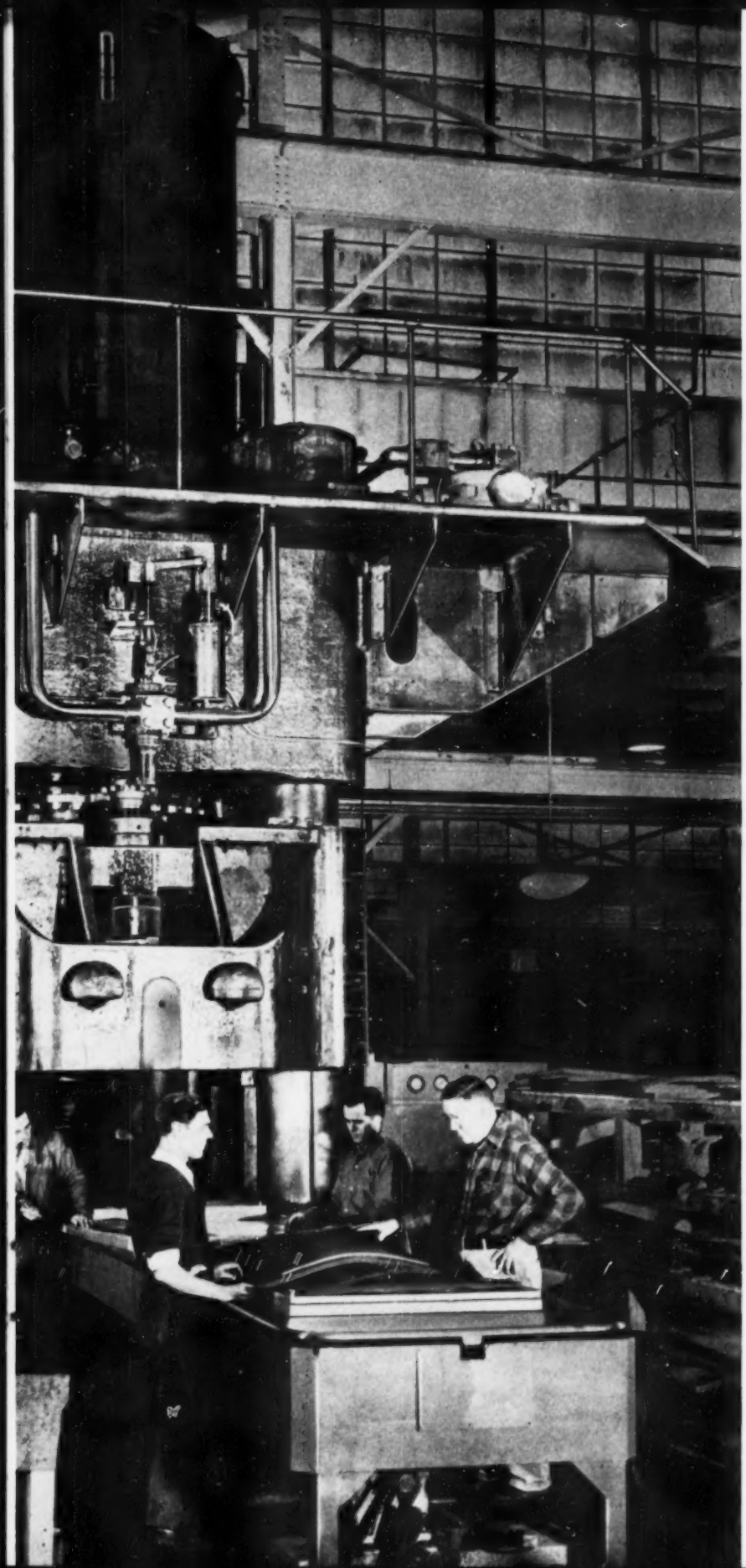
● Officials of the Active Tool and Manufacturing Company, Detroit, Michigan, count on trouble-free hydraulic operation of this giant press. They place much of their confidence in the performance of STANOIL Industrial Oil — and with good reason.

Recommended by a Standard Oil lubrication specialist, STANOIL has served in the hydraulic system of this press for over four years. In all of that time, it has not been necessary to replace the original fill of oil nor has the hydraulic system once needed to be cleaned. Periodic tests of oil samples have shown that STANOIL, despite hard service and high oil-operating temperatures, has maintained a lubricating quality comparable with new oil.

You, too, can rely on this unique, versatile oil to give you clean, dependable service, not only in hydraulic systems but in such a variety of equipment as air compressors, reduction gears, electric motors, auxiliary turbines. The Standard Oil lubrication specialist serving your area of the Midwest will be glad to show you operating records covering the many applications of STANOIL. Phone him at your local Standard Oil office. Or, write: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY

(Indiana)



What's Your problem?

P. E. Stratton, of Standard Oil's Detroit, Michigan, office, is the lubrication specialist who has helped the Active Tool and Manufacturing Company keep hydraulic maintenance at a minimum through use of STANOIL Industrial Oil.

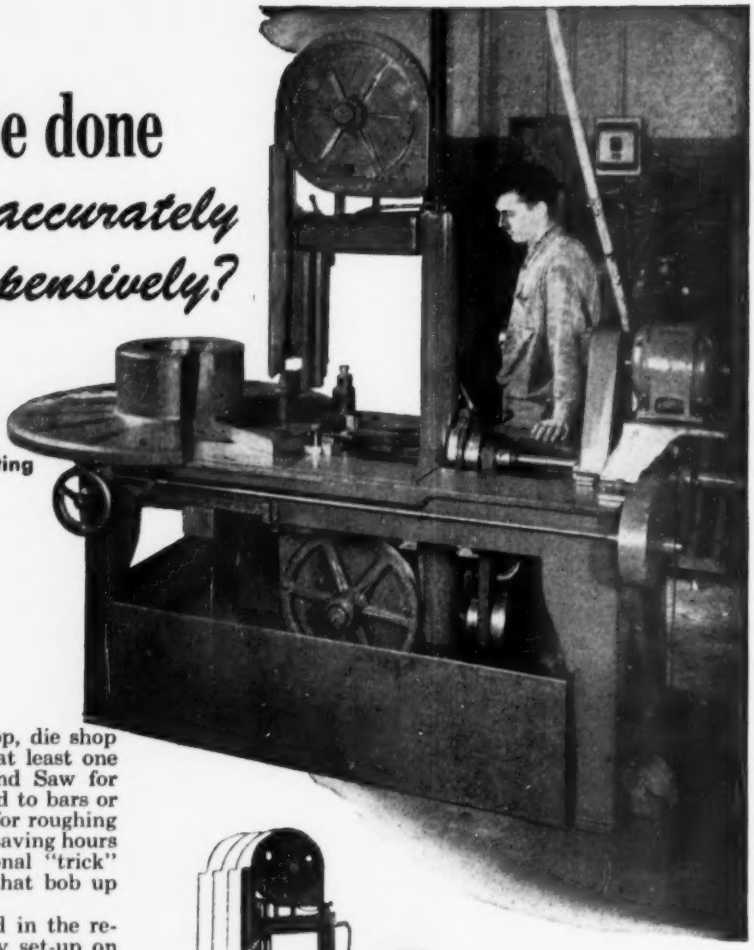
He is one of many Standard Oil specialists located throughout the Midwest. These men have the practical experience and special training to handle lubrication problems on any type of operation.

Take advantage of the service offered by the lubrication specialist in your own locality. You can contact him easily by phoning your local Standard Oil Company (Indiana) office.

STANDARD

How else could this job be done

so easily, so accurately and so inexpensively?

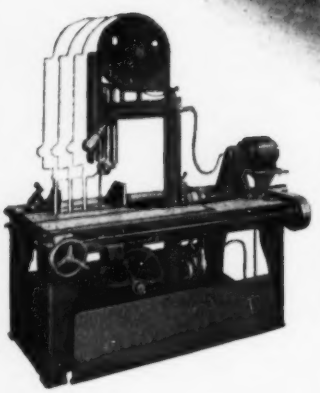


Segmentation of 42" Steel Casting

Every tool room, machine shop, die shop and maintenance department needs at least one No. 8 MARVEL Metal-cutting Band Saw for cutting off anything from ⅛" drill rod to bars or billets of 18" x 18" cross-section . . . for roughing large work to size and shape, thereby saving hours of machining . . . for those occasional "trick" jobs, impossible on any other saw, that bob up in every plant.

Odd shapes that can't be held in the removable, quick-action vise, are easily set-up on the No. 8's large, T-slotted work table. MARVEL Overload-Relief Power Feed insures accurate cuts under the most adverse conditions because blade pressures are automatically held within limits which are pre-set instantly for each job. The blade is never forced beyond its capacity to efficiently and accurately remove metal . . .

Close limits are further assured through the work being clamped rigidly to the bed of the saw and the blade power-fed through it instead of pushing the work through the blade. This is also true in miter cutting, as the blade column—*not the work*—is swung to the required angle. The handiest, most versatile machine tool, it is also the busiest in most shops.



This double exposure illustrates how the blade maintains its vertical position while moving into and through the work, impelled by the automatic MARVEL Overload-Relief Power Feed.

Column set at angle to cut 45° miter on 18" beam. Entire saw column can be swung to cut at any angle from vertical to 45° right or 45° left.

MARVEL *Metal Cutting* **SAWS**

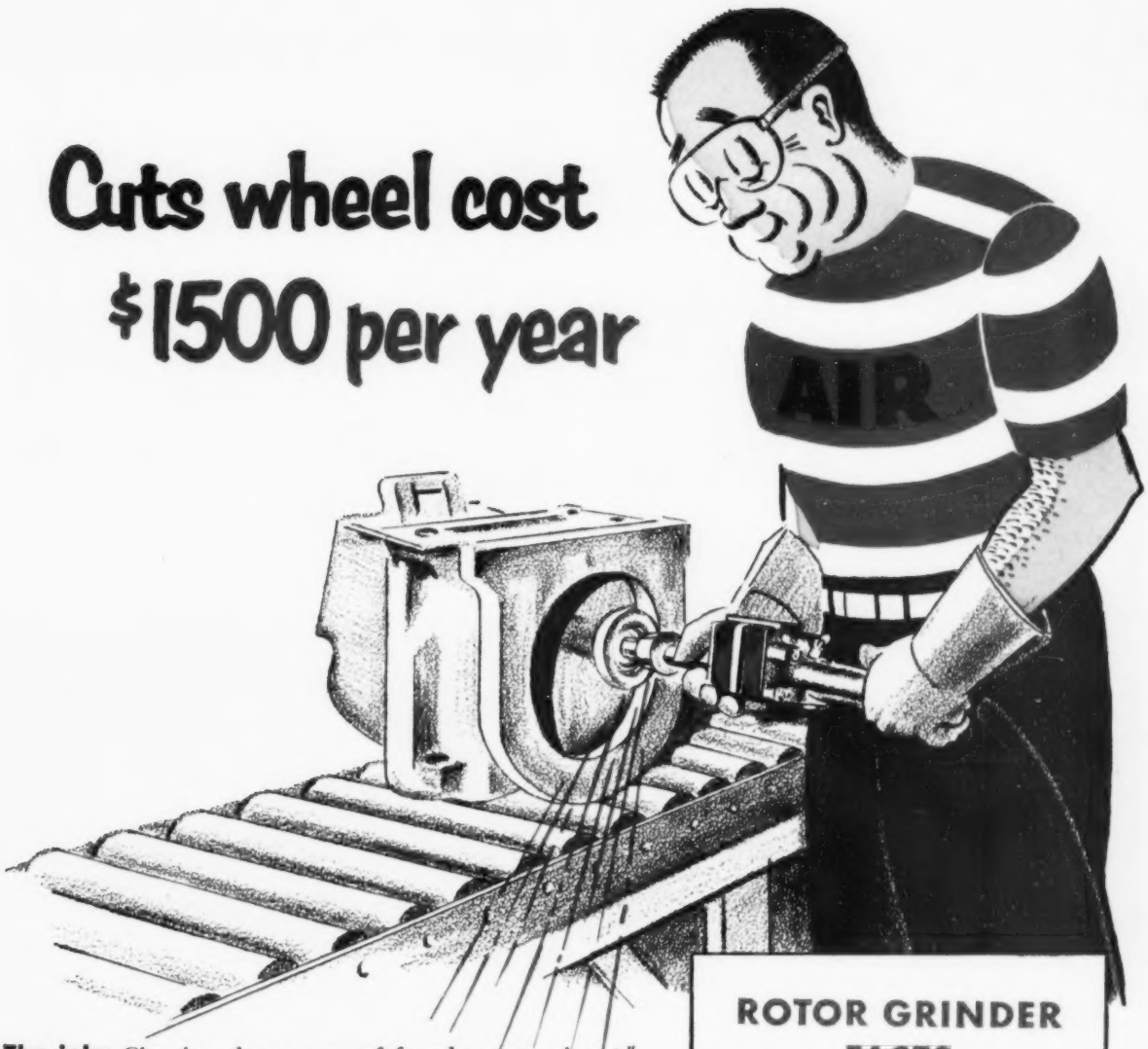
Better Machines–Better Blades

Write for Catalog

ARMSTRONG-BLUM MANUFACTURING CO.

5700 Bloomingdale Avenue — *"The Hack Saw People"* — **Chicago 39, U. S. A.**

Cuts wheel cost $1500 per year



The job: Cleaning department of foundry was using 8" wheels with 4500 rpm grinders. When worn down to 5" or 6", wheels lost surface speed and metal removal dropped off. Wheels were laid aside or thrown away at this point.

Solution: Rotor Analyst suggested use of two Rotor 6000 rpm air grinders to use up discarded stub wheels.

Results: Investment of $400 in new Rotor Grinders saves $1500 yearly in wheel costs.

How much will this idea save in *your* plant? Ask your Rotor Analyst for a trial grinder to find out!

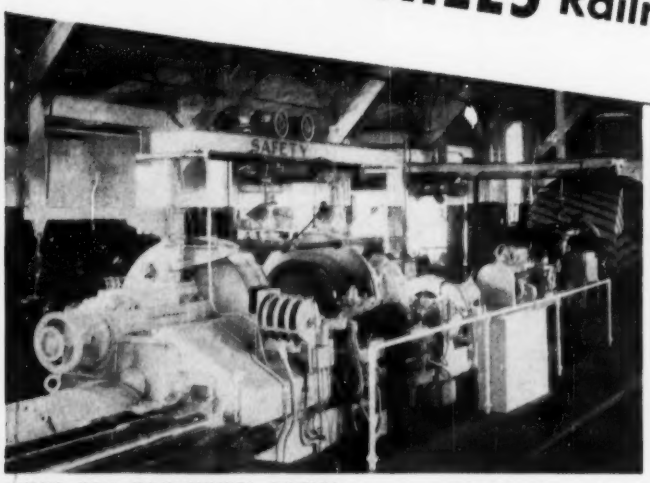
ROTOR GRINDER FACTS

Rotor D125—6000 rpm—9¾ lbs.
Rotor D88—6000 rpm—9 lbs.

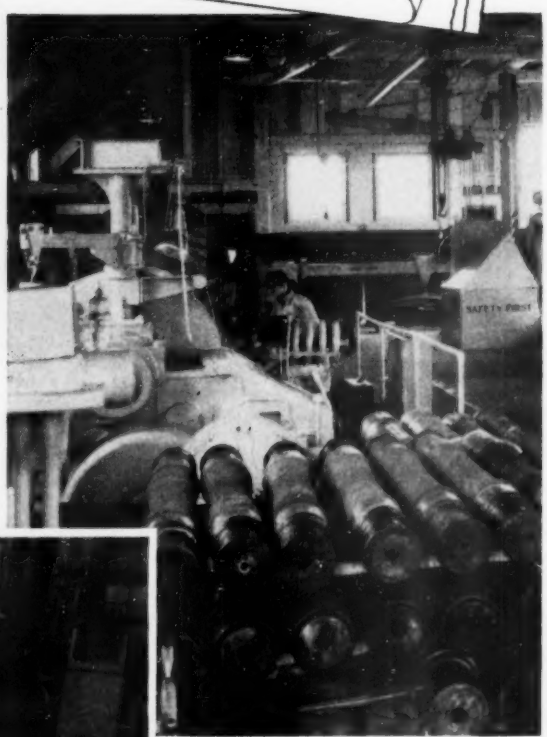
Others from 3100 to 20,000 rpm. Straight or spade handles. Ask for Catalog No. 38.

BALTIMORE & OHIO RAILROAD

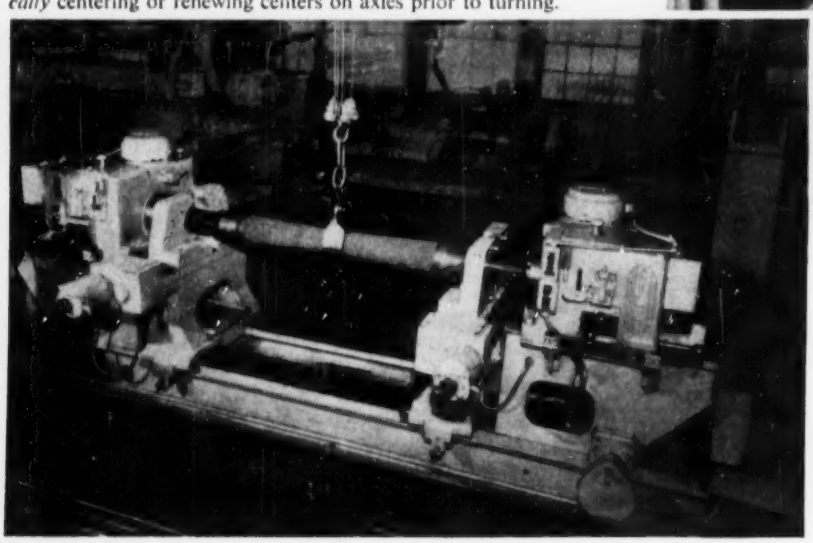
Constantly *doing things*—better! . . . with modern NILES Railroad Tools



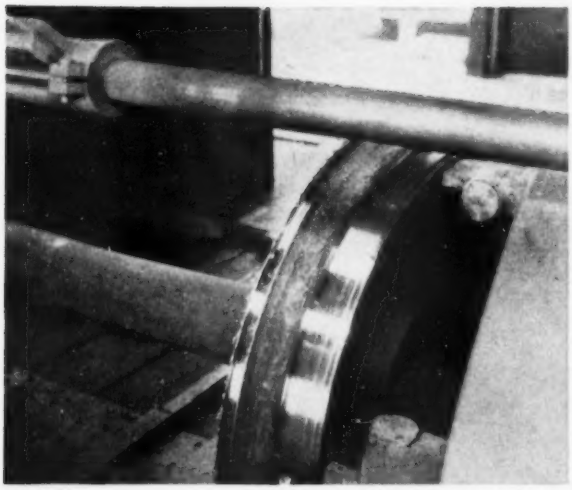
NILES 52" CAR WHEEL LATHE in the B & O's Ivorydale (Cincinnati) Shops verifies the B&O slogan "constantly *doing things*—better," by re-turning car wheels 140% faster than the lathe it replaced.



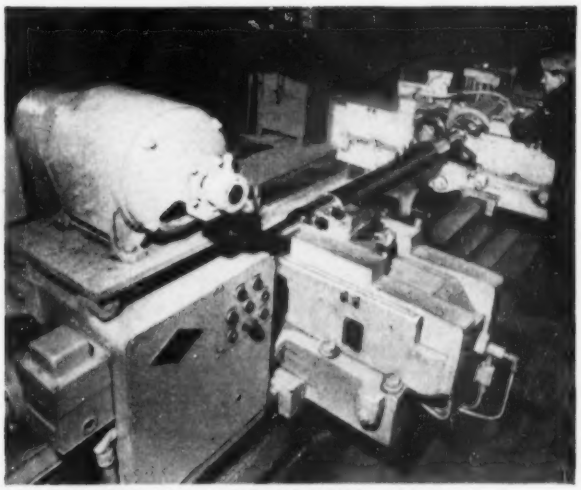
NILES HYDRAULIC AXLE CENTERING MACHINE in the B&O's Glenwood Shops assures high production and low waste by *automatically* centering or renewing centers on axles prior to turning.



BALDWIN
BLH
LIMA-HAMILTON

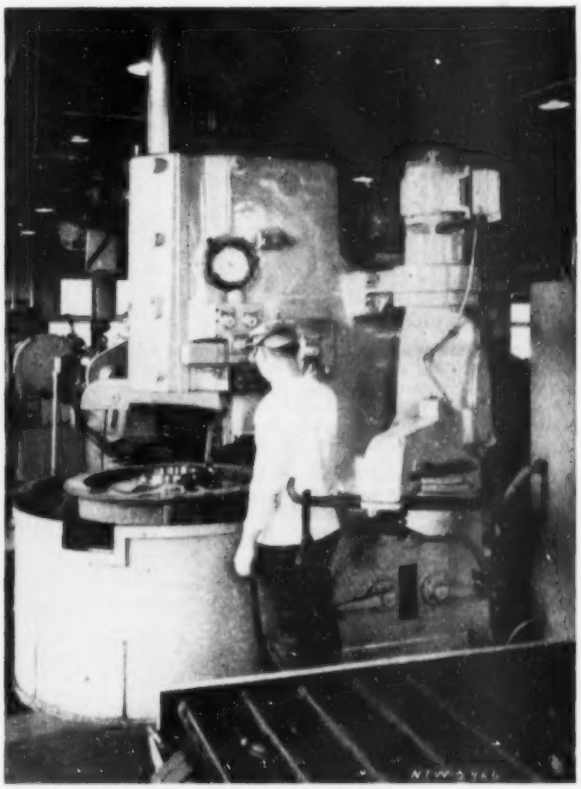


CLOSE-UP of the turret on the Niles 52" Hydraulic Car Wheel Lathe profiling and flanging tools in simultaneous operation. This Ivorydale installation was the first equipped with hydraulic feed traverse and contour profiling.



NILES HYDRAULIC BURNISHING LATHE Glenwood (Pittsburgh) Shops is saving at the rate of 1,000 man hours for the first year and its fully automatic operation does better work uniformly.

SHOP SCENE at Ivorydale shows four of their modern Niles Railroad Tools in operation . . . Left Rear: Niles 52" Car Wheel Lathe; Right Rear: Niles 48" Wheel Borer at work; Right Center; Two Niles Center Drive Axle Lathes. Foreground: Stocks of axles and wheel sets before operations.

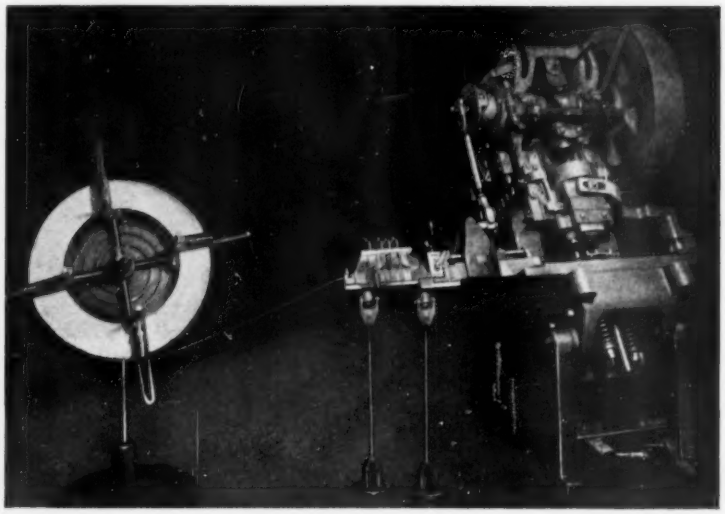


NILES 48" HYDRAULIC WHEEL BORER hub facing and hub turning at the Ivorydale B&O Railroad Shops.

BALDWIN-LIMA-HAMILTON

Hamilton Division • Hamilton, Ohio

U.S. SLIDE FEEDS REDUCE COSTS



The photograph shows a conventional setup consisting of a U.S. Slide Feed and a U.S. Plain Straightener on a standard open-back inclinable press.

—even on low Production Runs!

METHOD OF FEEDING	TIME TO SETUP DIE	TIME TO SET FEED	TIME TO RUN 1000 PIECES	TOTAL TIME	TIME-SAVING EACH ADD'L 1000 PIECES
HAND FEED	SAME FOR HAND OR AUTOMATIC FEEDING	NONE	30 MINUTES	30 MINUTES	
AUTOMATIC WITH U. S. SLIDE FEED	SAME FOR HAND OR AUTOMATIC FEEDING	20 MINUTES	10 MINUTES	30 MINUTES	20 MINUTES

The belief sometimes exists that long production runs are necessary for the economical use of automatic feeding equipment on punch presses. A New Jersey manufacturer of electrical devices has disproved this theory by the advantageous use of U.S. Slide Feeds where the required production is as low as 1000 pieces.

At this plant the same press and feed are used for producing a variety of parts. In changing from one part to another, they simply install the proper dies in the press, and reset the feed to provide the proper pitch or feed length.

Experiments have been made to determine the production quantity where automatic feeding becomes profitable. They have found this to be a production run of 1000 pieces. Their findings on a typical job are illustrated in the table above.

It will be noted that for any run in excess of 1000 pieces, substantial gains are made by using U.S. Slide Feeds. It should be pointed out that the jobs in question involve the use of progressive dies necessitating the maintenance of controlled accuracy of pitch. U.S. Slide feeds provide the required accuracy without the use of pilots or stops. In addition, the Slide Feed pulls the material through a U.S. Plain Straightener and maintains controlled accuracy.

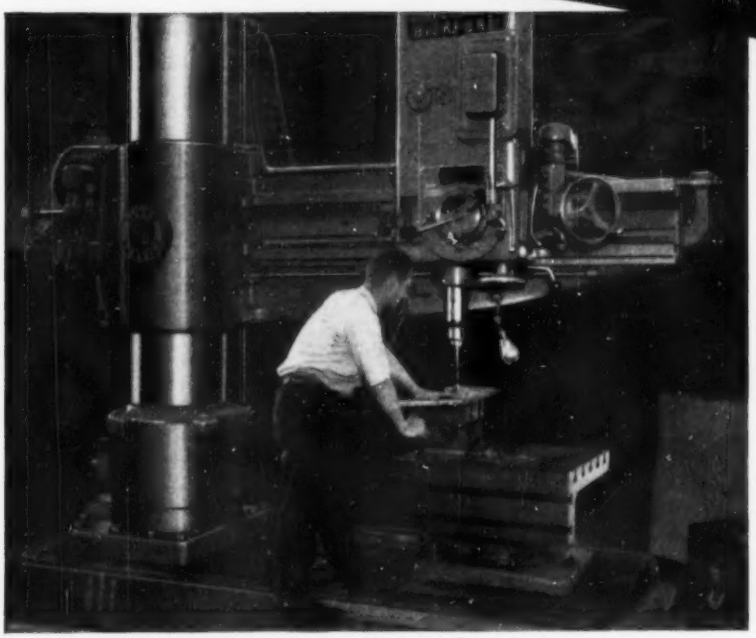
Bulletin No. 80-A gives complete specifications for U.S. Slide Feeds and other units, such as Straighteners, Stock Reels, Coil Cradles, Scrap Choppers, Oilers and Wipers. Write for your copy — there's no obligation.

PRODUCTS

U. S. TOOL COMPANY, Inc.

AMPERE (East Orange) NEW JERSEY

super service FOR "egg beaters"



Photographs courtesy of the Piasecki Helicopter Corporation.

These Helicopters for Army, Navy and Air Force are being produced to exacting accuracies at the Piasecki Helicopter Corporation at Morton, Pennsylvania. A Cincinnati Bickford Super Service Radial Drill was selected for its accuracy, speed and easy handling as part of a current cost-reduction program used in the jig and fixture department producing tools for the Egg Beaters.

Write for catalog R-29.

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RADIAL AND UPRIGHT DRILLING MACHINES

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OLIVER DRILL POINTERS

Properly machine ground drills give better performance. OLIVER Drill Pointers, with each lip doing equal work, give balanced cuts—more accuracy—more perfect holes,—more efficiency—longer drill life.

As Illustrated:

No. 21 Oliver Bench Drill Grinder. Hand operated for Drills No. 57 to ½".

No. 510. For Drills ¼" to 3"—2-3-4 flute.

OLIVER DIE MAKING MACHINES

Efficient, speedy and accurate — effecting great savings in time and costs. Skilled labor is not required for sawing, filing and lapping operations.

Available in 3 Models.

Bench Model 5-1 (Illustrated) — Single Speed Die Maker for use on Tool Steel up to 1" Thick.

Heavy Duty Model (Illustrated) — 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

OLIVER ACE UNIVERSAL TOOL & CUTTER GRINDERS

Keep your most difficult cutters sharp with Oliver ACES. They excel on high speed and Tungsten Carbide work. Direct reading for clearances reduces fatigue — eases operators' jobs.

The ACE excels for grinding face mills up to 15" also, slab mills • slitting saws • all types cutters and reamers.

2 Models: Heavy Duty (Illustrated) and Standard.

OLIVER 20" TEMPLATE TOOL BIT GRINDER

Efficiently powered by a 3 h.p. motor, this OLIVER Machine grinds on the periphery of a 20" wheel. Capacity tools up to 1½" wide, ⅞" to 13" high from 0 to 20° clearance. The OLIVER is developed for production sharpening of single point Tungsten Carbide and high speed tools, offers increased production, lower tool costs and savings in man-hours. Extremely fine finish assured.

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Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Cutting Oils and Chip Disposal

Probably nothing that I recall shows the drastic changes in shop operation in the last half century, better than the article on cutting oils and chips by John D Romer (*AM*—Aug 17 '53, p102). Lard oil, machine oils, and soda water were the three coolants in use fifty years ago. Each had strenuous advocates, not forgetting the famous Fink cutting compound which the *AM* exposed early in its history.

Lard oil was the favorite for fine tool work, and many old machinists felt it an insult to be asked to use ordinary oil or soda water. Some even bought their own lard oil. Chip disposal was seldom a problem, except perhaps in railway shops where men on wheel lathes vied to see who could produce the longest chip without having it break. The way they maneuvered, and the time all hands spent in clearing a path for the long, twisting chips from driving wheels, cost more than anyone realized. I am not sure as to the longest chip ever produced, but I saw one hung up as a trophy which was well over 100 ft long.

High-speed machines and new cutting steels make chips disposal a major problem. The points brought out in the article in question would make an old-time machinist feel that he was in the wrong business, and that no one without an engineering degree should hope to be even a foreman in a modern shop. And he might even be right at that.

High-speed cutting necessitates rapid chip removal. Both this and the use of great quantities of coolants pose other problems that the old shop never knew. Economic machining in a modern shop has introduced problems that we old-timers never dreamed of.

Managers in such plants must be engineers or research men, or have such people available. The machining of metals efficiently has become a real profession and, as a result, we are securing better and more efficient management. The use of new materials, new cutting tools and the handling of both work and chips, requires better executives and engineers than ever before.

FRED H COLVIN
Point Pleasant, N J

Double Edged

I have read the fine editorial "Men Are Important, Too," by Burnham Finney (*AM*—Sept 14 '53, p119). His suggestions would help many plants

GRINETICS

BY D G SMITH

FORGED SHAPE

STANDARD PARTS

RIP FENCE

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Smith & Mills SHAPERS

Rugged power for "roughing." Sensitivity for accuracy and fine surface finishing. Exclusive solid ram for stamina, low maintenance and easier adjustment. Standard and heavy duty models for modern tool room and production service.

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16″
20″
24″
25″
28″
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36″

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General Office: 640 W. Washington Blvd., Chicago 6
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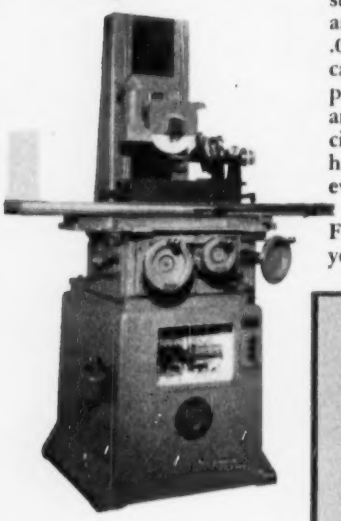
Fine Shapers since 1888

You have precision at your finger-tips when you use REID GRINDERS

Every move counts, with no tiresome reaching or bending, when you operate a Reid. All controls are right at finger-tip level . . . always under your complete control, reacting instantly, without backlash or wheel play.

Such dependable performance, the result of Reid's built-in accuracy, insures precision to meet the closest tolerances. When the shop order reads .0001", put the work on a Reid and you can be sure that the finished piece will pass inspection. Reid Surface Grinders are designed and precision-built by specialists who put the results of over a half-century of experience into their every detail.

Find out the full story on Reid Features for Better Grinding: request your copy of Bulletin 618-1.



Elevating hand wheel, graduated in .0005"
Optional: Vernier, graduated in .0001", for elevating hand wheel
Cross feed hand wheel, graduated in .001"
Power feed (Model 618V), automatic adjustable cross feed from .006" to .100" at each reverse of table.
Table speed, 12-35 feet per minute
Work capacity: 6" x 18"
Table size: 51" x 8"
Standard wheel: 7" x ½" x 1¼"

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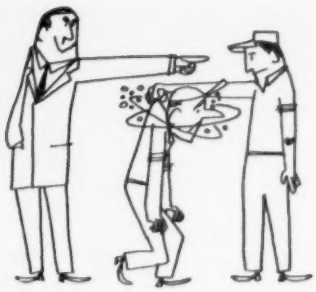

to reach top production and high quality. The best machines in the world will not give us top production if people won't. Top management should create the desire in every employee to produce to the best of his ability. Foremen and employees should be treated as associates. Actually, that's what they are, for the profits of the firm affect them all.

Management may not realize it, but the average employee would rather have that feeling of importance than a raise in pay. Every day, in many plants, management makes changes with no advance notice to the foremen. The foremen do the same thing with no advance notice to the employees. In the words of Mr Finney, this arouses suspicion and distrust. The sharing of ideas, policies, and methods gives the employee a feeling of belonging. Cooperation should work both ways—from top to bottom and from bottom to top.

A E SALMONS
Tool Supervisor
Dixon Valve & Coupling Co
Philadelphia, Pa

Orchids for Two

The Oct 12, 1953 issue of AMERICAN MACHINIST will go down in publishing history as a great achievement. While its size was impressive, that was not a record. But to be able to show the striking modernization of the Ford Motor Co in such detail indicates a confidence in the integrity of a publication that is almost never found in modern business. It also shows a willingness on the part of Ford to advance American production methods.

I was also greatly impressed with the attractiveness and quality of many of the advertising pages. Brown & Sharpe Mfg Co, for example, a few years ago, confined its announcements to a mere introduction of new devices, as was common at the time. Now, however, the B&S advertisements cannot be overlooked and are impressive in their artistic attractiveness. Such methods of presenting the

merits of a product are perhaps as striking as the manufacturing methods of Ford.

As one who has known *AM* in the 1880's and who has been connected with it for over 40 years, I would like to congratulate the present editors on achieving heights in publishing that we never dreamed of during my active participation in its editorial work.

FRED H COLVIN
Point Pleasant, N J

Diamonds Were Never Cheap

Every now and then, through a misconception that is easy to understand, something appears in print that is very bad for our industry.

There is a very attractive and clever cover (*AM*—Sept 14 '53) calling attention to an item on page 2. Every person who picks up the magazine would certainly read these ten lines entitled, "Diamond Lil." Thus the statement, "Of course, these are industrial diamonds, and worth only about $2.70 a carat, but that's up plenty from the pre-Korean figure of 52 cents," pretending a rise of over 500% in the last three years, would indicate either that the producers were gouging industry, the distributors were profiteering, or the product was becoming too high-priced, and substitutes must be found.

Importation price is now approx $2.30—just prior to Korea it was about $1.80, only 22% less. The $1.80 figure arrived by stages after World War II, not from 52c but from about 92c. There was a 52c figure, but this was not a normal market price. It was established by agreement between Britain, U S, and the African mining interests as a win-the-war gesture to encourage use of diamonds in war production. This should never be quoted as a market price.

ATHOS D LEVERIDGE
Executive Manager,
Industrial Diamond Ass'n

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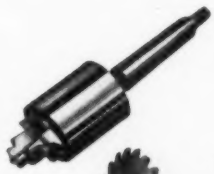

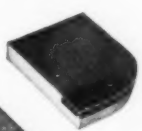

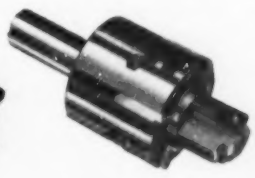

When your production machining problem dictates the use of special carbide tooling, your nearby Gorham Field Engineer can give you the right answers fast! He's an expert in the design and application of special cutting tools . . . and he provides a complete engineering service to determine your exact requirements.

He begins with your product, sketch or idea. He surveys your production operations and available equipment. He considers work material properties and required finishes and tolerances. He plots speeds, feeds and methods of tool driving. Then he develops practical design and metallurgical specifications for a special tool that's "tailor-made" for your application. And his recommendations are backed by Gorham's more than thirty years' experience in the design, manufacture and heat treatment of fine cutting tools.

Yes, your nearby Gorham Field Engineer is a helpful man to have around! If you haven't yet met him, write for his name, or send details of your problem direct, and we'll have him get in touch with you promptly.

Gorham TOOL COMPANY

"EVERYTHING IN STANDARD AND SPECIAL CUTTING TOOLS"

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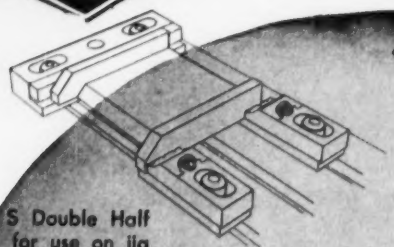
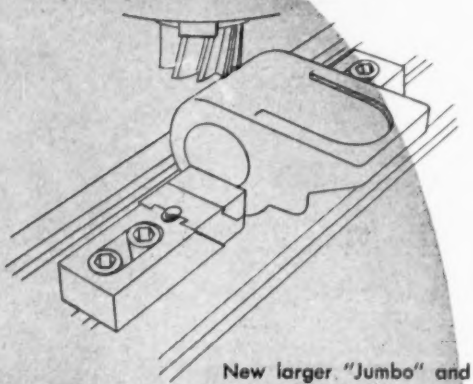
Eliminate U-Clamps, Straps and Fingers

J & S *All-Purpose* JAW CLAMPS

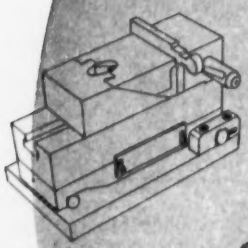
secure work-pieces quickly and rigidly
easily adapted to box fixtures

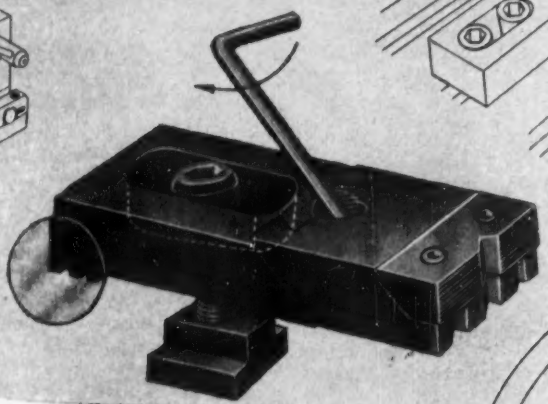


J & S Double Half Vise, for use on jig borers, millers, planers and shapers.

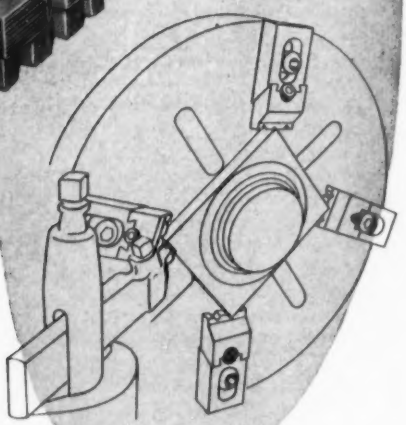


New larger "Jumbo" and "Lil-Giant" clamps for use on larger-type planers.





Precision Grinding Vise with or without sine bar allows rapid unloading and exact relocating.



Typical lathe application. Standard clamp in use.

NEW METHOD OF SECURING WORK-PIECES TO MACHINE TOOLS

for Lathes, Planers, Milling Machines, Boring Millers, Jig Borers, etc. (9 different types including new Counter Clamp)

1. **Faster Set-up:** *One adjusting screw* provides a 5-ton force to *position* and *hold the work-piece.*
2. **Stronger Grip:** The *inward* and *downward* movement of the jaw clamp at a 45° angle gives a *single, powerful clamping action* — easily applied and controlled.
3. **Less Obstruction:** You can pass over the whole clamp 1" from the working surface of the machine face. *No interference with reading or measuring tools.*

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—contains complete details on advantages, applications, types and sizes available.

Booklet describing J & S "Fluidmotion" Wheel Dressers, etc., also sent on request.

.0001" ACCURACY

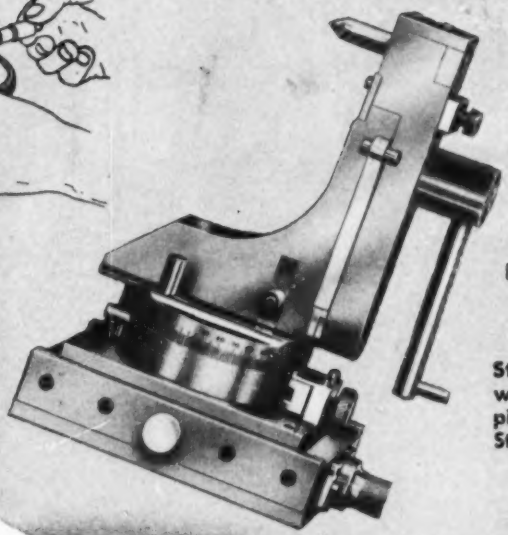
eliminate elaborate set-ups and operations

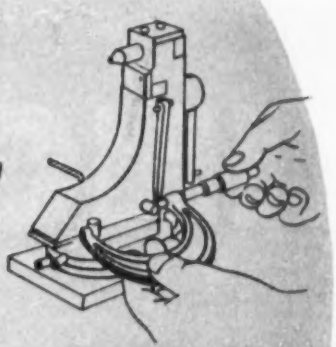
Fluidmotion WHEEL DRESSERS

dress two angles tangent to a radius in one continuous motion

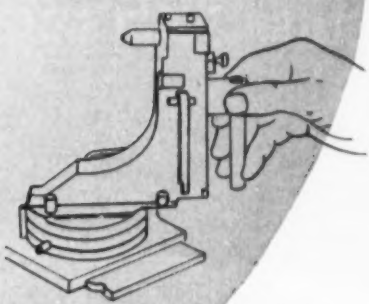
High-Carbon, High-Chrome Construction

Step 1. Obtain micrometer reading as shown, and add required convex radius or subtract required concave radius.





Step 2. Next loosen gib with wrench and "mike" over lower pins to reading obtained in Step 1.



Step 3. Tighten gib; set stops for two angles; ready for action.

ADAPTABLE TO ALL TYPES OF CYLINDRICAL AND SURFACE GRINDERS

With the "Fluidmotion" Dresser, you can *dress* two angles *tangent* to a radius—using one handle *in one continuous motion*. Operation is so fast and simple that beginners can use them to boost your grinding machine out-put. Forms are always clean, precise—angles and radii "flow" into each other. Contours are consistently sharp, accurate to .0001", without tool or chatter marks.

Write for new folder!

—contains complete details on advantages, applications, types and sizes available.

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At Kaydon ENGINEERING CORPORATION:

Maintenance Costs on KING VERTICAL BORING & TURNING MACHINES

Less than $25 a year PER MACHINE!

Photo courtesy of American Machinist.

A 65¼" dia. Bearing Ring is shown being machined on a 72" KING Vertical Boring & Turning Machine at The Kaydon Engineering Corp. Accurate machining of these large diameter, thin sections is essential, since machining distortion cannot be removed by heat-treating.

The Kaydon Engineering Corporation, Muskegon, Michigan, manufactures a complete line of high precision ball and roller bearing assemblies, with rings of 4" bore to 120" OD. An essential part of Kaydon's distortion control methods for manufacturing these large diameter bearing rings having thin sections—often under ½" at the raceway—is *accurate* machining of the ring OD, face, and groove on KING® Vertical Boring & Turning Machines. (See photo above.)

Mr. Maurice Jensen, General Superintendent of the Kaydon Engineering Corporation, makes the following statement concerning his experience with KING machines: "Three 72" Kings have been in operation for about two years, 24 hours a day, five days or more per week, and our total maintenance cost for the three machines has been less than $25 a year per machine. One 72" King has been in operation for ten years with less than $50 yearly maintenance cost over this period."

Mr. Jensen further states, "It is possible to consistently produce pieces from these machines with a maximum eccentricity of .001. For high production runs and machining approximately .100 for a finish cut, we have successfully maintained a .005 tolerance, and we have found that the dial readings will repeat and give us a maximum variation of .003 to .005."

Here again is on-the-job evidence of typical KING performance . . . and why KING is industry's *first choice for accurate, economical work.* KING machines are made in 10 sizes, 30" to 144", in a variety of head combinations. Look into their advantages for *your* production.

American Steel Foundries

KING MACHINE TOOL DIVISION

1150 TENNESSEE AVENUE CINCINNATI 29, OHIO

SPOT NEWS of Metalworking

- **New automatic press loaders are claimed to increase output by as much as 300%** over conventional manual-loaded stamping and forging press equipment. Loader's 120° index table and offset-flanged drive motor permit die punch mounting at optimum dead center ram position. Loader control interlocks with press, assuring that ram won't come down unless index is locked in position.

- **Chicago tool and die shops report backlogs are dwindling dangerously.** Affected most are small and medium shops. Out-of-town shops are starting to come into Chicago area to bid for available work, it is reported.

- **Pocket-size x-ray radiation sources for industrial use** are being developed at Armour Research Foundation. Here's how they work: in making an x-ray of an airplane wing, source is put inside wing, film is placed around outside. Developed film shows x-ray picture of wing structure.

Powdered magnesium fuel can be burned in an engine developed by Dr Joseph H Scharen, Reade Mfg Co. It is claimed that 1 lb of magnesium fuel gives same power as 60 lb of aviation gasoline. Similar to a diesel engine, but with spark ignition, engine handles fuel with either a liquid or solid stabilizing agent.

- **Electrical equipment manufacturing is California's fastest-growing industry,** a state survey shows. In the last four years, total work force has grown from 21,300 to 67,500 workers—one-third of them women.

- **"Mighty Mite" jeep equipped with three fire-fighting agents** can put out almost any kind of fire in jig time at Convair Fort Worth. Main equipment: 150 lb of chemical powder, sprayed from two 150 ft hoses at 40-50 psi.

- **Ultimate mechanical strength of 100,000 psi** is claimed for aircraft structural aluminum alloy HZM 100 by Harvey Aluminum Corp. Alloy permits use of extrusions of lesser cross-sectional dimension.

- **Persia will buy from $50 million to $200 million worth of industrial machines** from West Germany, partially paying for them with raw material shipments.

Ford Motor Co's new Special Products Division is expected to split the Lincoln-Mercury combine by producing (1) Lincoln Continentals, Cosmopolitans and Capri's, and it is rumored, ultimately (2) a fourth Ford nameplate. (See p 109).

- **Low-cost industrial truck leasing plan** is being offered on a nationwide basis by Clark Equipment Co. Equipment is leased on three or five year basis. Monthly rentals decline in proportion to age of machine.

- **Purchase of industrial equipment and machinery for Israel** is being facilitated by establishment of Israel Enterprises, Inc, New York and Tel Aviv, capitalized initially at $2 million by Israel to finance industrial expansion.

- **Maintenance shops in Indo-China will get $500,000 US machine tools** financed by Washington. Similar program is being carried out on Formosa.

- **Meehanite Metal Corp has developed a market research plan** for its licensees. Plan will provide information to each licensee on methods to use in analyzing its own market and area with a view to getting a better share of business.

The operator brings the rotating lapping stone into contact with work centers to correct inaccuracies.

EX-CELL-O

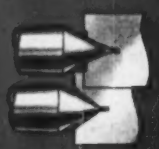
CENTER LAPPING MACHINES

FOR GREATER PRECISION IN SUBSEQUENT MACHINING

Meeting today's precision standards requires careful checking of every phase of the job, *including the center holes in the work.* Ex-Cell-O Center Lapping Machines correct inaccuracies of center holes, thus contributing to greater precision in all subsequent operations performed between centers. These machines are precision built and are easy to operate. The lapping stone is dressed to a 60° angle by a hand operated diamond dresser. An adjustable dresser for other angles also is available. These machines are fully described in Bulletin 40271—a copy is yours for the asking.

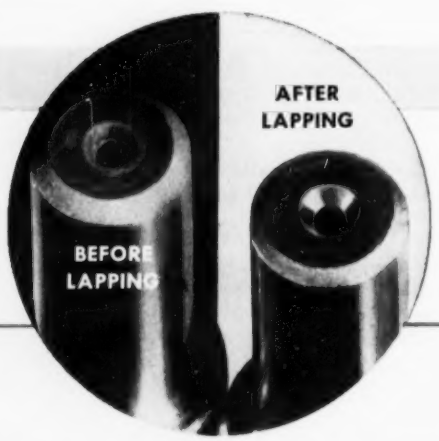
Eliminate out-of-line, out-of-round, and incorrect angles by Center Lapping

OUT OF LINE


INCORRECT ANGLES

OUT OF ROUND

CENTER LAPPED



EX-CELL-O CORPORATION
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MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES
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DAIRY EQUIPMENT • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS

53-14

Washington

ODM has revised its tax amortization and defense manpower policies in moves to channel more defense work into labor surplus areas. But the new action is pretty feeble and isn't expected to really prove much of a boon to regions hard hit by unemployment.

The tax writeoff revision will provide higher amortization rates to defense firms who locate new plants or expand existing facilities in chronic labor surplus areas—there are 17 major ones and 22 smaller communities, many of them textile or coal mining towns.

The new policy does not make it easier for anyone to get fast writeoffs. All it does is allow companies who are already eligible for rapid amortization (because their industry is covered by a specific ODM expansion program) a higher rate than they would be allowed in places that don't have "chronic labor surpluses."

This means that a machine tool builder, eg, will now get an 80% writeoff if he builds a new plant in a place like Lawrence, Mass, while he would get only 70% if he builds the plant in a place not classed as a chronic labor surplus area.

The new policy won't mean much to distressed areas, mainly because ODM's defense expansion program has been petering out. Expansion goals are the basis for fast tax writeoffs. There are 235 of these, only 40 of which were less than 75% under way last March. ODM is putting finishing touches on an up-to-date status report, in which some of these will now show up complete and many unfinished goals will be formally closed. And except for titanium and maybe one or two other raw materials (where fast tax writeoffs aren't the important expansion incentive anyway), there are no plans to increase the expansion goals.

The only way the fast writeoff device could be used to really aid distressed areas would be to permit accelerated amortization for all new plant construction and expansion in these communities—for non-defense as well as defense industries. New legislation would be needed for this, since ODM lacks proper authority. Outside some labor unions, however, not much pressure has been generated for this proposal so far.

• • •

Contract set-asides will now be used as the main device to help distressed areas. A specific portion of a defense procurement program will be set aside for negotiation with firms in labor surplus areas. To be awarded defense contracts, these companies must meet prices set through competitive bidding. This scheme has been used some before, but mainly as an aid to small business in all areas, not necessarily labor surplus regions.

• • •

The antitrusters are asking new authority to subpoena company records and company officials to make it easier to get evidence to back up antitrust suits. Antitrust Chief Barnes says he'll ask for this authority from Congress next year.

As things stand now, the antitrusters have to get grand juries to investigate possible criminal charges—and the grand juries have the power to subpoena officials and evidence in order to decide whether an indictment should be handed down. The antitrusters then use the evidence gathered by the grand jury in filing a civil suit that seeks a court order ending alleged violations of the law.

Attorney General Brownell and Barnes are bragging about the number of cases they've filed since they've been in office. They claim they've filed about as many cases as the Democrats did during their last year in office.

• • •

Barnes is skeptical about negotiating settlements with alleged violators of the antitrust laws without going to court. He has negotiations under way on six or eight cases. But he complains that company lawyers "talk cooperation, but nothing happens."

Barnes is still strong, though, for settling cases through consent decrees. This means filing a case—and then negotiating a settlement with defense attorneys without going to trial. Such agreements have the same effect as a court decision, and have to be approved by the court in which the case was filed.

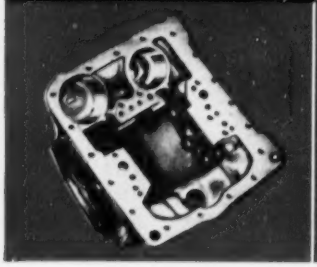
Antitrust cases that might have defense implications are being checked first with the National Security Council. That includes the biggest case on record—the one against American Smelting and Refining Co and St Joseph Lead Co for monopolizing the lead industry.

• • •

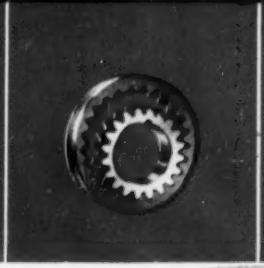
Secretary of Labor Mitchell is making sure that he will be Eisenhower's adviser on labor policies. He doesn't want another "Steelman" in the White House. Recall how John Steelman handled the big labor problems for Truman.

Mitchell is asserting his influence beyond the confines of the Labor Dept. He is holding regular meetings of the heads of independent federal labor agencies to discuss current labor problems. He stopped a Commerce Dept official from making a speech on Taft-Hartley amendments. And he is being allowed to veto Presidential appointments to labor agencies.

TRANSMISSION CASE (CAST IRON) THREE TYPE I, ONE TYPE III SURFACES



PUMP GEARS (CAST IRON; STEEL) SIDE SURFACES, TYPE IV



TRANSMISSION COVER AND GOVERNOR BODY (BOTH ALUMINUM) TYPE III SURFACES

PINION GEARS (HARDENED STEEL) THREE TYPE II, TWO TYPE IV SURFACES

FOR PRECISION FINISHING OF FUNCTIONAL SURFACES

PowerFlite transmission parts are *Microhoned*

Chrysler engineers, with years of proficiency in production-processing of precision parts, have specified the Microhoning process as the method for obtaining

✶ DIMENSIONAL ACCURACY ✶ GEOMETRIC PRECISION ✶ CONTROLLED SURFACE FINISH

required for the efficient functioning of the new PowerFlite transmission.

FOUR TYPES OF SURFACES IN THE *PowerFlite* ARE MICROHONED:

Type I—Cylindrical surfaces through which a piston or valve moves.

These surfaces must be round, straight and accurately sized, with a controlled surface finish—in order to minimize wear and eliminate oil leakage. The Microhoned finish assures non-flaking surfaces between the stationary and moving parts.

Type II—Cylindrical surfaces in rotating parts.

Microhoning maintains concentricity of pitch diameter of teeth and the bore of gears, permitting teeth to mesh with minimum noise and wear. The bore must have precise geometry, size, and functional finish to retain a lubricating film at high speed.

Type III—Flat surfaces that are bolted together without a gasket.

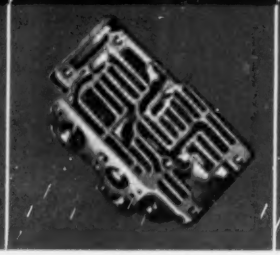
They must be flat enough so that they will not distort when pulled together, and must have a surface finish that will mate to form a tight, effective seal.

Type IV—Flat surfaces that move in contact with stationary surfaces.

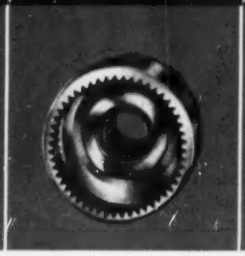
These must be smooth and flat in order to minimize friction and wear, and maintain a "running seal", thus eliminating leakage.

For more information on the Microhoning process write to:
Field Engineering 87
Micromatic Hone Corporation
8100 Schoolcraft Avenue
Detroit 38, Michigan

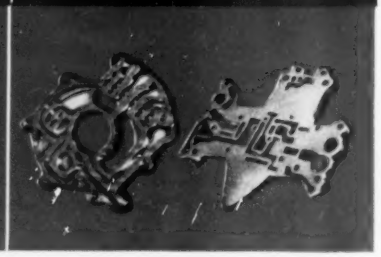
VALVE BODY (ALUMINUM) TWO TYPE III, ONE TYPE I SURFACES



KICK-DOWN GEARS (STEEL) TYPE IV SURFACES



TRANSFER PLATE AND REGULATOR BODY (BOTH STEEL) TYPE III SURFACES



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MICROMATIC HONE CORP.
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206 So. Main Street
Rockford, Illinois

MICROMATIC HONE CORP.
1535 Grande Vista Avenue
Los Angeles 23, California

MICROMATIC HONE LTD.
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MICROMATIC HONE CORP
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Pendleton, Indiana

REPRESENTATIVES:

Overgard Machine Tool Company, 234 Commonwealth Bldg., Denver 2, Colorado • Allied Northwest Machine Tool Corp., 103 S. W. Front Ave., Portland 4, Oregon

REPRESENTATIVES IN ALL PRINCIPAL COUNTRIES

Detroit

Independent auto companies are suffering sales setbacks this year, but they are not in any worse shape now than they were in the fully competitive years before World War II.

The Big Three in the years 1937-1941 captured 89.7% of total industry sales, leaving independents and several foreign manufacturers to scramble after the remaining 10.3 per cent. By a rather remarkable coincidence, the Big Three over the first nine months of this year took precisely the same piece of the market—89.7%.

On the surface, that would not seem to presage collapse for the six domestic independent nameplates. Nonetheless, these smaller companies this year have fallen from post-war performances with a resounding thud. Over the seven-year span between 1946 and 1952, the independents sold 14.5% of the total market. But in the first nine months of 1953, their share declined to 9.7%, while the Big Three took 89.7% and Austin, MG, British Ford and others have divided the minute balance.

Production totals paint as vivid a picture. In 1951, the independents produced 12.8 per cent of the total; last year, 13.4 per cent. During the first ten months of this year, according to *Ward's Reports,* they sagged to 9.05%.

Thus, over the long term, the independents are almost exactly where they were 15 years ago. Over the short term, they have lost the important ground gained in post-war years.

With almost two months of production time still ahead, 1953 enthroned itself as second highest production year in history. In ten months, 1953 displaced 1951 (5,330,000 cars) as next best year behind 1950. When November ends, car production for 11 months should stand at over 5.7-million units. Combined with truck production, the total through November likely will be very close to 6.9-million.

• • •

Ford during the year has very definitely proved the claim it made in 1952 that it is the industry's second largest producer. Arguing then before NPA for a larger share of steel allocations, Ford was not able to substantiate fully its contention. So far this year, it has outproduced third-place Chrysler by nearly a quarter-million cars.

All of which has wrought a subtle change in Chrysler's sales philosophy. Acknowledging that it cannot match GM or Ford in production capacity, Chrysler is contenting itself with the view that it is concentrating on quality rather than quantity.

• • •

Judging from talk in auto engineering circles, the next big major trend in autos will not be toward styling or power or comfort, but toward safety.

That would mean development of stronger bodies with reinforced side and door panels; improved headlights, brakes, suspensions, tires; wider use of pop-out window glass, recessed instruments, padded dashboards, etc.

Early evidence of the trend is the new emphasis being placed on the safety features of power steering, which enables a driver to maintain control of a car even when a tire blows out at high speeds or the right wheels go off the road on to a soft shoulder. Advertising to date has dwelt mostly on the ease of handling provided by power steering, but next year, the safety factor likely will become the main sales point.

• • •

Chrysler will bear watching in the next running of the Pan-American Road Race. Smarting because of Lincoln's sweep of the race last year, Chrysler entered in its parts catalog a "heavy duty kit," consisting of dual carburetors and manifolding, dual exhaust system, mechanical valve lifters and more powerful disc brakes.

Couple that with the 235-hp FirePower V-8 Chrysler is putting in its larger 1954 models and the result is a beautifully performing and very fast car, as Chrysler proved at Indianapolis.

There, such a model covered 2155 miles in a 24-hour sustained run. Previous Indianapolis stock car recorded for a 24-hour run: 1,910 miles.

• • •

Establishment of a Special Product Division at Ford appeared to mark the first definite move by the company toward sending Lincoln and Mercury on their separate ways, a split-up the company has said will come eventually.

Conceivably, the new division will combine with Lincoln, with William C Ford as general manager, while Mercury would be headed by Benson Ford.

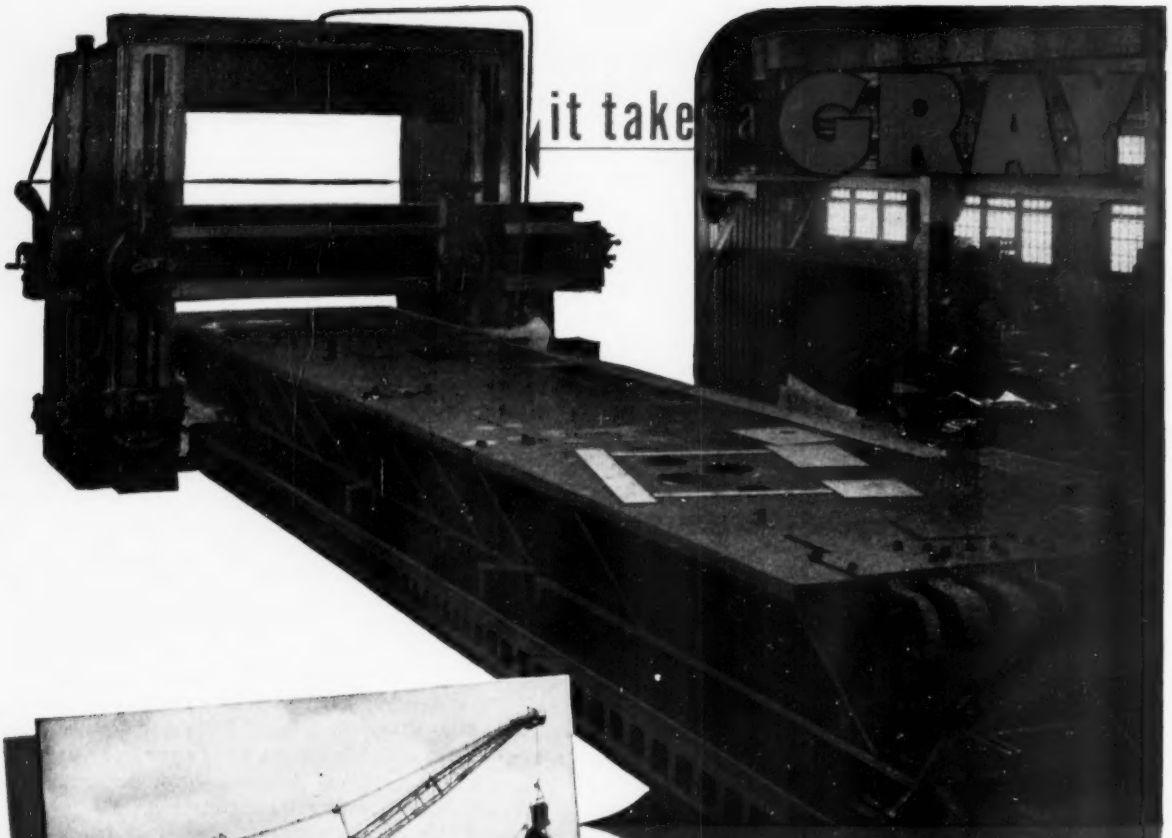
The Special Product Division becomes one of 15 operating divisions of Ford, and will have its own manufacturing, product engineering, finance, purchasing, sales and industrial relations departments in Dearborn.

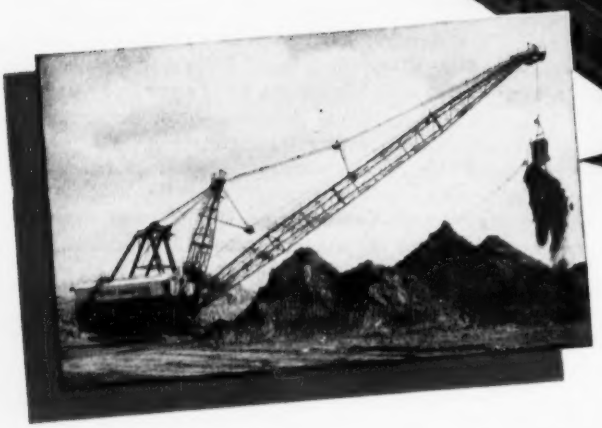
Indications are that in addition to Lincoln Cosmopolitans and Capri's, the division will produce Continentals and a fourth line of Ford Motor Co cars.

• • •

Chrysler's hopeful planning that it could introduce its 1955 models in May of 1954 fell by the wayside, largely because it would have been next to impossible to get dies in time.

Company officials admit they "toyed" with the idea. Probable reasoning: The company's 1955 line reportedly is ultra-stylish. Springing the cars in the middle of the peak sales season conceivably would have hypoed Chrysler sales.





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Machine Tools

The machine-tool industry has a backlog of $800 million, Perrin G March III, assistant administrator of the Business and Defense Services Agency, revealed at the annual meeting of the National Machine Tool Builders' Assn.

Defense-rated orders amount to less than one-third the backlog. The ratio of defense-rated orders to new business is now down to 18%.

In April, some 18,000 machine tools were outstanding on pool contracts, Mr March revealed.

About 15,000 of them were assigned to firm orders. By year's end, the uncompleted machines in the pool program will be down to 2500, of which only 500 will be unassigned.

The number of pool order machines in GSA storage will be up to 700 by December.

In August, more machines were sold from storage than were placed in storage. However, about 644 machines are in storage today.

Machine-tool builders have voluntarily cancelled $92 million of pool orders.

• • •

The machine-tool industry has delivered to customers 225,000 machine tools since Korea, executive vice president Ralph Howe of New Britain Machine Co told the NMTBA meeting. Of that number, 94,000 were military-rated and 65,000 carried other ratings. Only 66,000 tools, or 29%, went to domestic customers.

• • •

Nothing has been done yet about spending the $250 million Vance Plan fund for long lead time machine tools, though one-third of the government's 1954 fiscal year has gone by.

No one in Washington professes to know even now whether this money will be spent or for what it will be spent.

Some Washington officials are suggesting that the fund can be used for acquisition of any strategic production facilities which may be in danger of being lost for defense work.

Truth is that any outlay from the $250 million fund probably will wait on the decision of the government's high command as to how much mobilization we are to have.

Joint Chiefs of Staff have not come up with concrete ideas of what weapons they will want in time of war and in what quantities.

• • •

General Services Administration is believed to favor the sale to machine tool builders of more than 3000 machine tools now installed in builder's plants under terms of facilities' contracts.

Builders have a purchase option if the two parties can agree upon a price formula.

One point is clear, however. GSA is thinking in terms of getting back most of its investment in its machines or there will be no sale.

One plan that GSA is reported to be considering is to charge the market price at time of acquisition minus the rental fee of 1% a month.

This would figure out to 75% of the acquisition price for a two-year old machine that had been installed in a builder's shop on a rental basis.

GSA would welcome a solution of the problem of its machine tool holdings that would permit retention of the machines in plants.

Implications of any machine tool price formula arrived at by GSA are clear. The formula might well be used later on as a pattern if the armed services should ever put on the market surplus machines built in the post-Korean period.

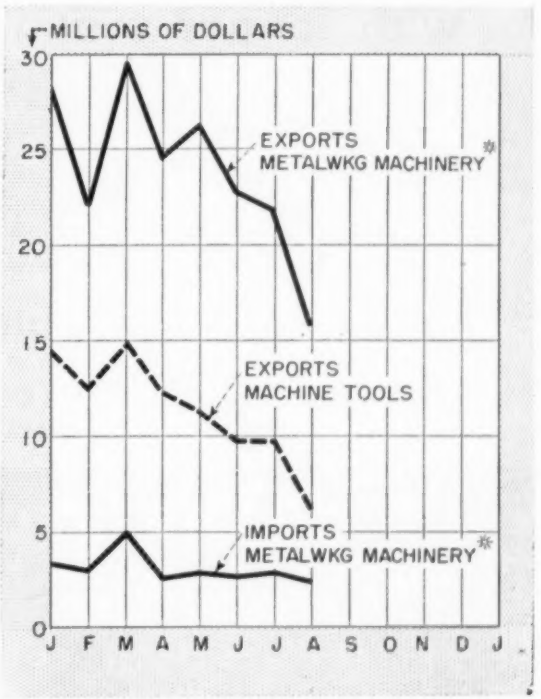
• • •

Exports of machine tools started the year with a bang and in August had slipped to a monthly dollar volume of only 44% of the January figure (see chart on this page).

Shipments abroad in January totaled $14.5 million. By June they had declined to $9.8 million and in August were down to $6.4 million.

BF

METALWORKING MACHINERY IMPORTS and EXPORTS 1953



* includes machine tools

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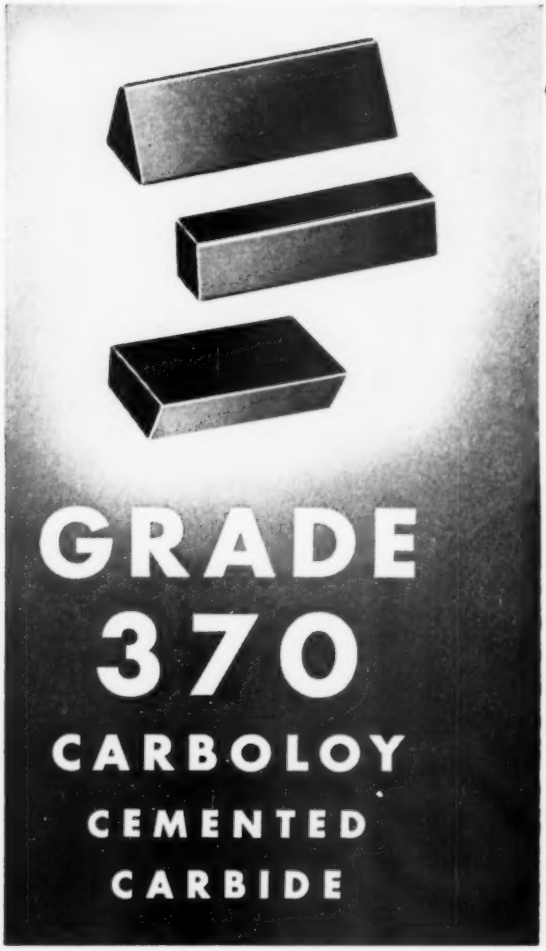

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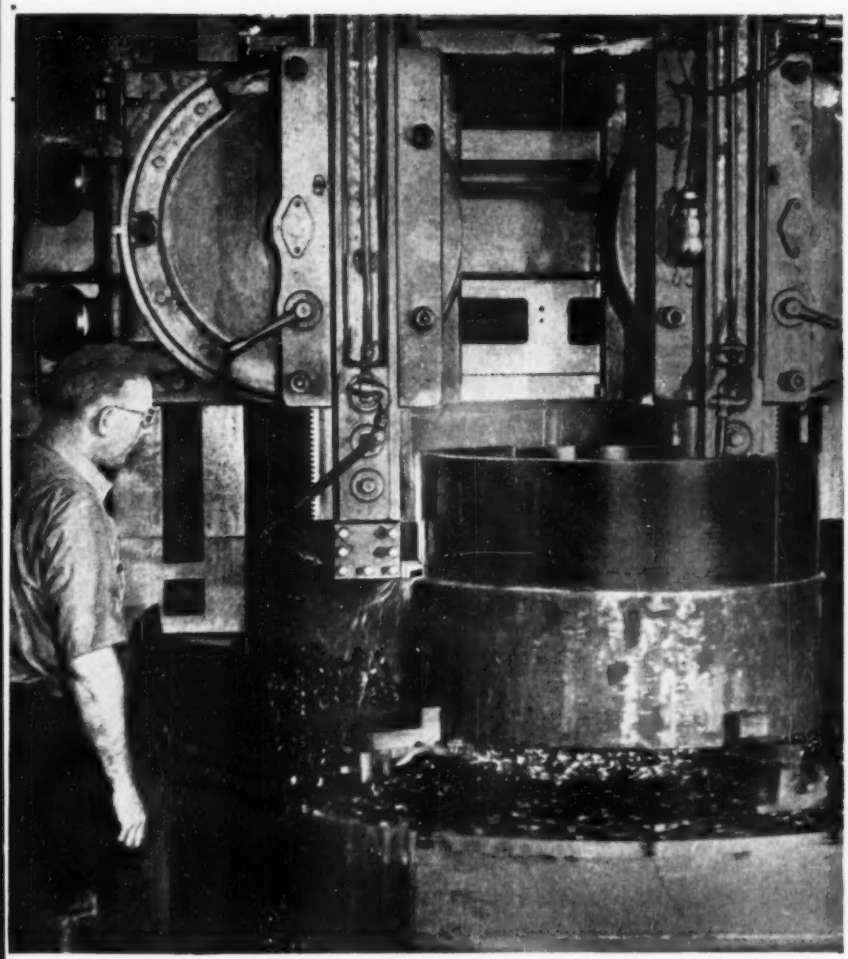
It's Grade 370 Carboloy Cemented Carbide – the first of an entirely new series specially developed for taking heavy cuts in steel at higher speeds. Unique grain structure lets it cut at around 1800° F without deforming – *higher than ever before practical* with any carbide. Tests and on-the-job applications indicate that Grade 370 can increase performance on many higher speed steel-cutting jobs by up to 30%. Now available in selected standard sizes and shapes.

"Carboloy" is the trademark for the products of Carboloy Department of General Electric Company



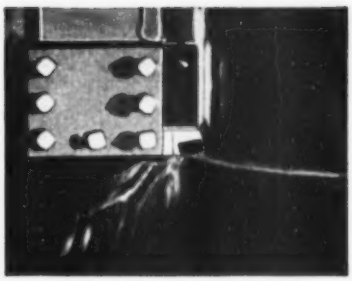
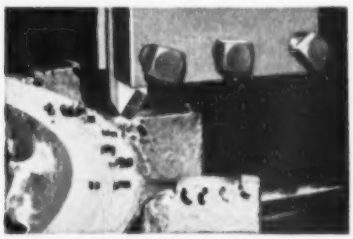


Photo at left and close-up, above, show Grade 370 taking a cut ½" deep, in large generator retaining ring of cast-alloy steel. The ring is machined at 110 FPM with .048" feed – causing tremendous heat to build up at the cutting edge. Grade 370 holds its shape and cutting edge under these tough conditions. Tool life increased 50%.



Above, Grade 370 machining generator stator frame. On this job a ½"-deep interrupted cut is made at a speed of 80 FPM with a .024" feed. Grade 370 continues to cut for longer periods under the constant jarring and high temperatures. Tool life increased 50%.

Grade 370 is the first of a new cemented carbide series tailor-made for today's *and tomorrow's* most severe metal-cutting conditions. The result of a quarter century of research- and development-pioneering in created-metals by the Carboloy Department.

MORE PERFORMANCE FOR YOUR DOLLAR

Its cutting superiority has been proved both in Carboloy laboratories and on tough on-the-job customer applications. On rolls, gun barrels, locomotive wheels and other heavy-duty operations, tools tipped with Grade 370 take heavier cuts at higher speeds and withstand higher temperatures than ever before practical – and this is done with even longer tool life than existing carbides. Tools cut more cubic inches of steel per minute . . . production goes up as much as 30%.

BUILT-IN TIP RIGIDITY

Exhaustive tests by Carboloy engineers showed that on heavy-duty, high-temperature machining applications where heavy pressure is encountered, other tools failed because the cutting edges deformed. Grade 370 is made from start to finish with a new, carefully controlled manufacturing process which gives it a built-in structural rigidity to resist this deformation – even at temperatures of around 1800° F.

AVAILABLE NOW

Grade 370 is available immediately in a number of sizes and shapes. Write today for additional information and for free technical literature. Carboloy Engineering Appraisal Service will work with you on specific applications.

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60 tractor crankshafts per hour with

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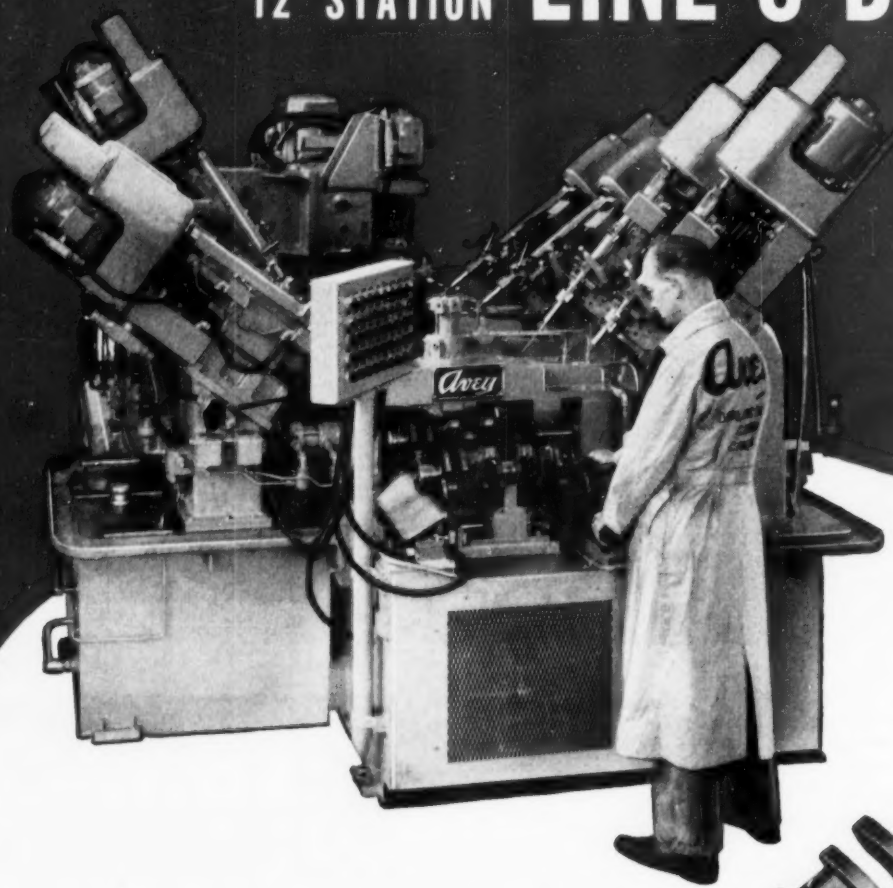

12 Station Transfer Machine—Hydraulically operated indexing mechanism—operations include drilling all angular oil holes plus connecting metering holes. Machine incorporates all Avey-draulic Torque-matic Units for Deep Hole Drilling with Avey Cam Units and Drill Heads for Meter Hole Drilling. Machine conforms to J.I.C. Standards.

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for drilling... tapping... production machines

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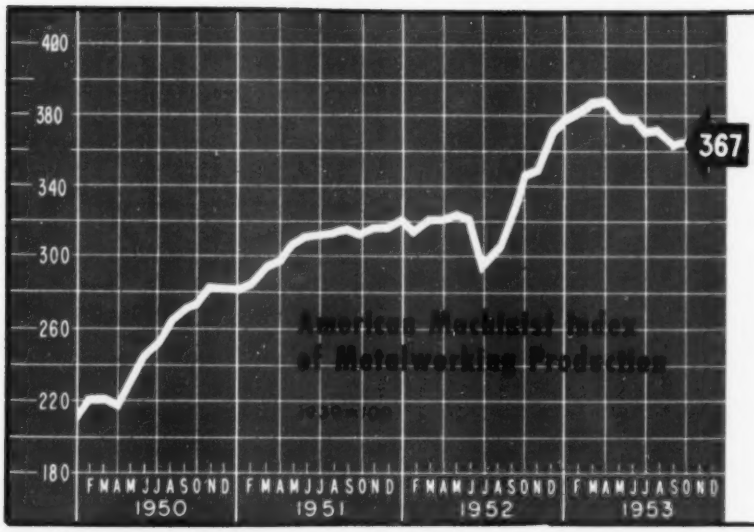
Cincinnati 1, Ohio

Gaging Metalworking



PRODUCTION INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	SEPT '53(*)	AUG '53(p)	JULY '53(r)	SEPT '52
Tot. Index	**367**	**367**	**364**	**330**
Machinery	317	320	303	
Electrical Machinery	425	418	383	
Autos	297	286	242	
Other Transportation	603	601	550	
Other Metalworking	367	365	325	

(*) Estimated (p) preliminary (r) revised

Metalworking production is trending downward in almost all segments as the year-end approaches.

Buyers are reluctant to make many new commitments. The result is that most companies are "living off the fat" at the moment. Shipments are greater than new orders.

This situation probably will continue the remainder of the year.

Many managements are confident that the first quarter will bring an upturn in business. But most companies agree that the peak demand of 1952 and 1953 is not likely to recur in the near future.

Defense work is slowly tapering. It still gives a lot of support to metalworking, however. Today's operations would be off sharply without defense support, especially in the aircraft industry.

• • •

Steel mill executives say that the first quarter may be better for them than this quarter.

The operating rate may not get above 90% but that means production of about as much steel as in the fourth quarter. Rated capacity for the industry will be higher then, because of new facilities nearing completion.

Here is a quick rundown of steel products: (1) wire items are slow, the season for heavy buying having passed; (2) cold-rolled sheet and strip are off 20% because of smaller releases from auto users; (3) hot-rolled sheet and strip and light plate are in strong demand, (4) all alloys are in good supply.

Steel operators are happy that they will be able to dispense with some high-cost production units in the days ahead.

Metal stamping people are generally cheerful about the outlook. September shipments were off 10 points to 154 on the Index of the Pressed Metal Institute. It is doubtful whether October was any better.

28% of the September output went to automotive customers and 21% to the military.

New orders dropped off 4 points on the PMI Index to 102. Automobile companies were the biggest buyers, providing 26% of the incoming business. The military accounted for only 15% of the total.

TV and radio set makers have come into the market more actively for stampings. Demand lags from truck builders and home appliance manufacturers.

• • •

Things are looking up in steel castings. Shipments, however, still are about 15% ahead of new orders.

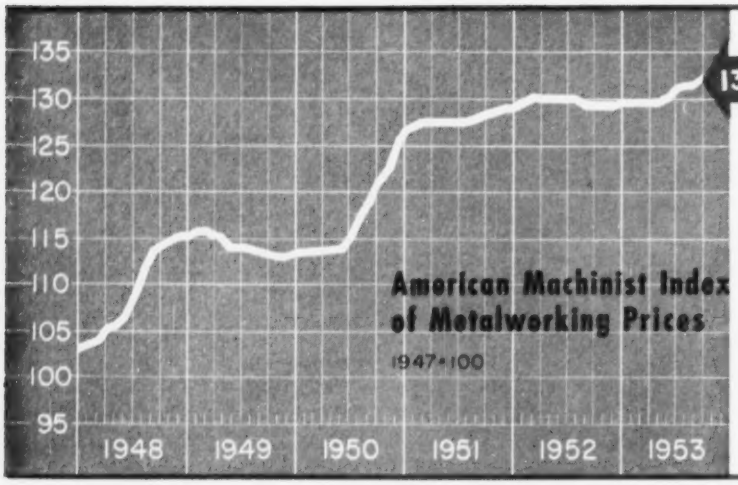
Industry backlog is down to about 2½ months. But some steel castings people can make deliveries within three weeks.

Buying seems likely to pick up in the Midwest and along the West Coast within 60-90 days. Best part of the outlook is the fact that demand promises to come from all directions, not from a single industry or for any particular size.

New orders for screw machine products have been shrinking since July. In September they were down to less than one-half of the March total, which was the 1953 peak. October is believed to have been no better than September.

Queries, fortunately, are increasing. Many shop operators feel that business will be better in December and the first quarter.

Gaging Business



PRICE INDEX

	SEPT '53(*)	AUG '53(p)	JULY '53(r)	SEPT '52
Total Index	**132.4**	**132.4**	**132.1**	**129.6**
Metalworking Machinery	**141.6**	**140.9**	**138.0**	
Other Machinery exc. Electrical	**136.8**	**136.4**	**132.2**	
Electrical Machinery	**131.1**	**130.7**	**124.6**	
Fabricated Metal Products	**129.0**	**128.8**	**128.0**	

(*) Estimated (p) preliminary (r) revised

Outlook for early 1954 now seems brighter. Two recent studies indicate that next year's business activity will be higher than anticipated.

McGraw-Hill Survey of Business Plans for New Plant & Equipment (AM Nov 9 p186) indicates a high level of capital expenditures for the first six months of 1954.

And new orders for machinery have been holding up well for several months.

Michigan Research Center's survey on consumer attitudes toward durable goods purchasing shows that consumers regard this as a good time to buy automobiles, television, radios and other appliances, and homes.

In recent years, Michigan Research surveys have proved extremely accurate.

• • •

Industrial production for 1953 will run ahead of 1952 by about 8%.

But current output rate is about 6% below the spring peak.

In other words, US economic activity has already experienced a sizeable correction.

• • •

Steel is averaging about 90-95% of capacity, compared with nearly 105% earlier this year.

Auto assemblies are expected to run less than 400,000 units in December, as against the 700,000 units a few months back.

• • •

Construction industry is feeling the pinch. Construction will hit an all time high this year. But recent rates point to a down-trend, and lumber, structural steel and clay products output is declining.

One reason for declining output; high level of manufacturers', wholesalers' and retailers' inventories. But the inventory situation isn't getting any worse.

And good Christmas business could level off soft goods inventories accumulated on dealers' shelves because of too-warm fall weather.

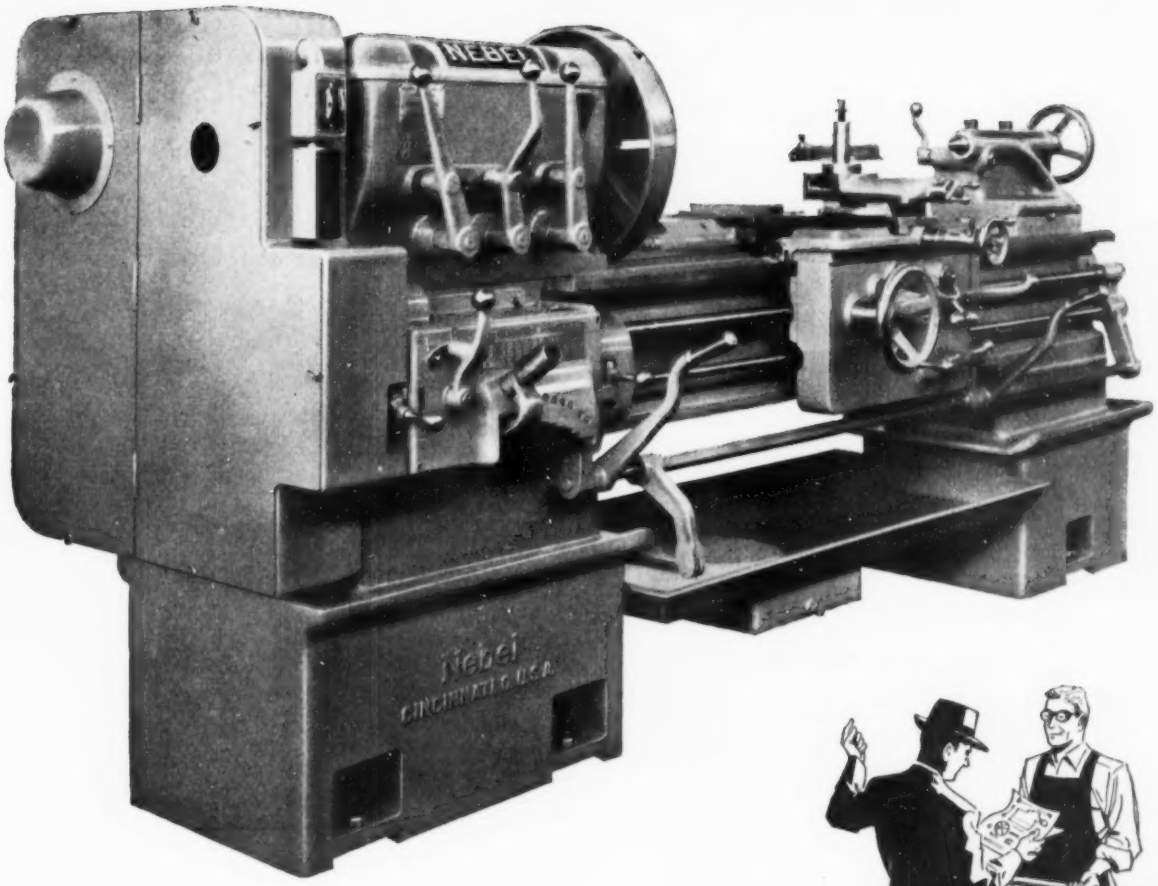
WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-1925 = 100)*	249.3	251.4	248.9
Steel ingot operations (thousands of tons)	2,092	2,096	2,215
Electric power output (million Kilowatt hours)	8,398	8,362	7,807
Production of automobiles and trucks	135,906	145,311	143,610
Engineering construction awards (*Eng. News-Record*—millions)	$251.7	$152.8	$411.5

QUARTERLY BUSINESS INDICATORS

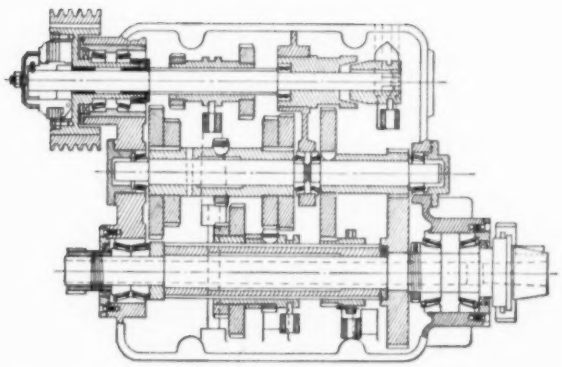
	Latest Quarter	Preceding Quarter	Year Ago
Gross National Product (billions)	$371.0	$372.4	$345.3
Expenditures of new plant and equipment (millions)	$27,080	$28,420	$26,960
Profits after taxes in primary iron and steel industry (millions)	$243	$228	$112
Profits after taxes in electrical machinery industry (millions)	$165	$194	$131
Profits after taxes in motor vehicles and parts industry (millions)	$272	$269	$262
Motors and generators new orders index (1936 = 100)	186.3	156.8	166.4
Profits after taxes in machinery industry (millions)	$278	$262	$290

* Seasonally adjusted



a good deal for owner and operator...

the new 20" Nebel 'LA' series lathe



Timken bearings throughout headstock. Front and rear pairs of spindle bearings can carry a radial load of 23,000 lbs at 100 rpm, thrust load of 9,266 lbs at 100 rpm. All headstock gears are shaved and hardened at no extra cost.

You need the new Nebel 20" 'LA' series lathe if you're an operator who likes to turn out good work quickly. And if you're the owner who likes lathes that cut costs without sacrificing quality, the new Nebel's for you, too.

It's smartly designed and engineered, heavily constructed and well equipped for medium duty turning... at an unbelievably low price.

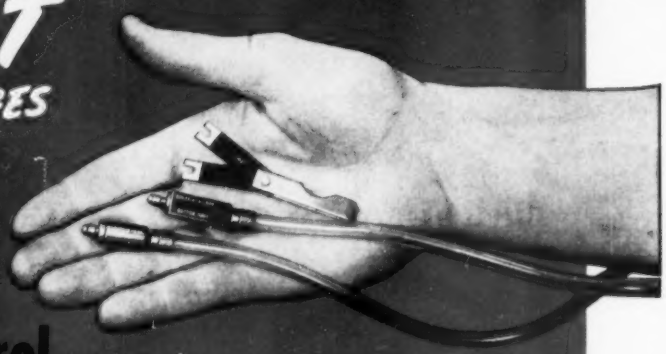
Write or wire for quotation today. The Nebel Machine Tool Co., Cincinnati 25, Ohio, U.S.A.

Nebel

WORKHORSE OF THE METALWORKING SHOP SINCE 1899

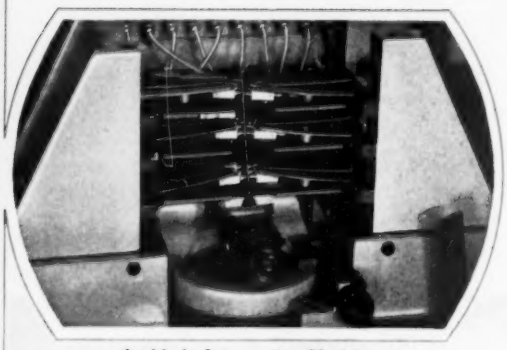
PLUNJET
GAGING CARTRIDGES

WIDELY USED
For Inspection and Machine Control



The Plunjet is made with both rectangular and cylindrical short and long housings.

Plunjets with Precisionaire for checking jet engine blades.



Jet blade fixture using Plunjets.

PLUNJET GAGING CARTRIDGES . . . the self-contained gaging heads you can use practically everywhere, were developed by Sheffield in 1949.

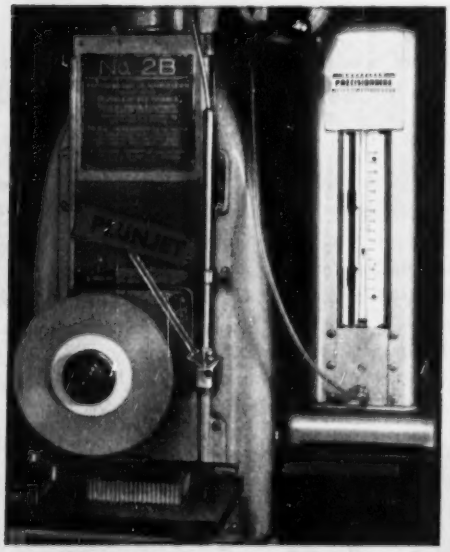
THOUSANDS ARE NOW IN USE on a wide variety of gaging fixtures and machine control applications.

MORE THAN FIVE THOUSAND are used on gages for checking jet engine blades.

PLUNJET GAGING CARTRIDGES ARE STANDARD LOW-COST STOCK ITEMS which can be applied by users to practically any gaging fixture or machine tool control where indication is required.

WRITE FOR ENGINEERING DATA giving ranges, amplifications, applications, mounting dimensions and prices.

IMMEDIATE DELIVERY FROM STOCK



Plunjet feed gage enables operator to grind to a degree of accuracy previously impossible.

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Don't Tamper with the National Reserve

It is high time that the federal government makes crystal clear its intention not to go into the business of leasing surplus machine tools to private industry for manufacture of civilian goods.

Defense mobilization order VII-4, issued by the Office of Defense Mobilization, supposedly disposes of this problem. But does it?

Let's look at what the order says. It specifies that tools owned by the armed services may not be leased for non-defense jobs "except when plans for leasing have been submitted by the Department of Defense and approved by ODM."

This "exception" is an escape clause that renders the entire order meaningless. Just why was the order worded so ambiguously? What kind of plans can be the basis for "exceptions"?

The wording of the order, and the alarm with which it is viewed in some quarters, would not emerge so importantly were it not for the existence of certain well-credited reports.

These reports have it that the weasel wording of the order carried out the wishes of people in high places in the Department of Defense. They wanted the order to be flexible so that almost anything could happen.

Top service officers are said to want authority to do as they please with surplus machine tools. If they see fit to lease machines, that should be their concern alone. If they choose not to lease, that is their business too. Fortunately the high command does not agree with these officers, at least not at the moment.

There is gathering evidence that the champions of Small Business, both in Congress and out of it, are beginning to lick their lips over the possibility that surplus machines from the armed services' reserves might be leased to small-shop operators to make anything from pins to toasters.

Remember that the reserve tools controlled by the Business and Defense Services Agency are just as subject to "exceptions" as the tools owned by Pentagon.

Political implications of leasing machine tools to Small Business are powerful. What is better for a politician running for office to point to than his efforts to aid "the little fellow"?

If government-owned machines are needed for production of defense items, well and good. They were acquired for that purpose in the beginning. As they no longer are required currently for armament manufacture, they should be kept for that purpose only and for no other.

All the machines from a given production line, as output is discontinued, are being preserved in so-called "production packages." These packages should not be broken up and tools from them used for non-defense work.

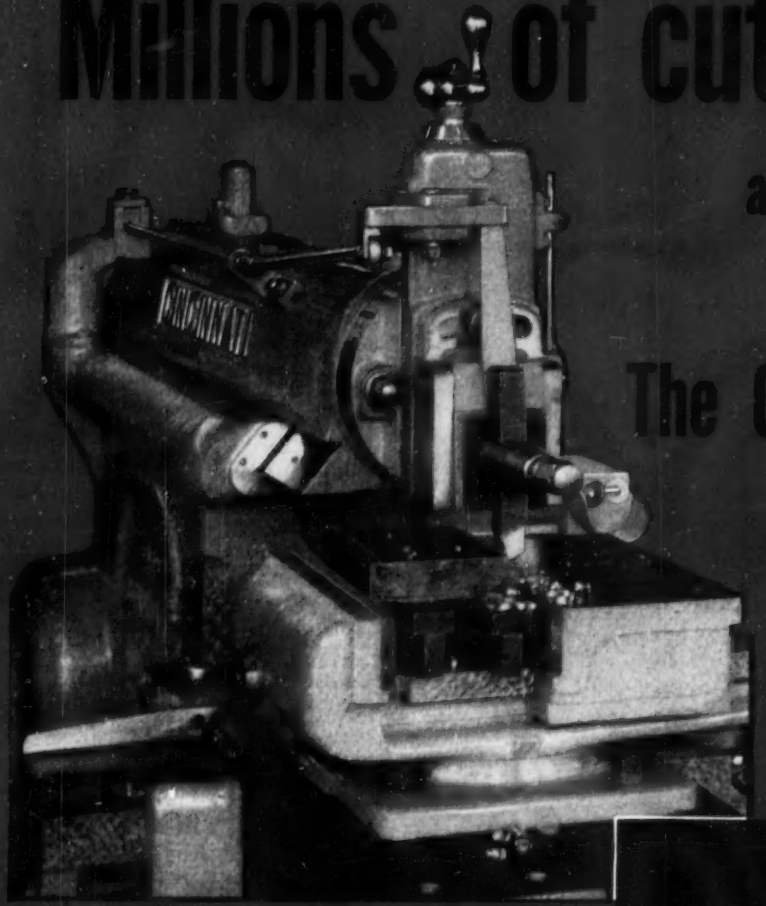
What's more, reserve machines bought and tooled specifically to make defense items to certain close tolerances should not be released for hard usage in civilian production. If needed in a defense emergency, they might no longer be capable of the same precision work for which they originally were bought.

Defense Mobilization Order VII-4, as now worded, offers inadequate protection against the raids that might be made on government-surplus machine tools for non-defense purposes. Such raids would both dissipate our national tool reserves and provide subsidies to set up manufacturers in unfair competition against those who had made capital outlays for equipment in their shops.

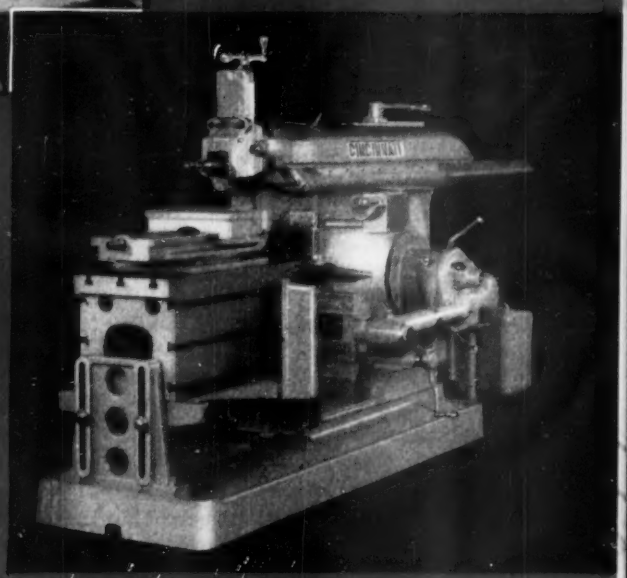
The order should be rewritten without delay before it becomes fully operative, or it should be superseded by a new order that states without equivocation and without exceptions that government-owned machine tools are as much a part of the national stockpile as guns and planes and bombs and therefore should not be tampered with.

Burnham Finney

Millions of cuts without a fault...



The CINCINNATI Tool Lifter!



The dependable Cincinnati Tool lifter, with positive return and lift, eliminates tool damage—operates at high speeds—and with angular settings of tool slide or clapper box. Protects and permits use to maximum advantage of carbide or high speed cutting tools.

After simple setting it is automatic, relieves operator and increases production.

Write for Shaper Catalog N-6.

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ZEISS INTERFEROMETER, operated by the author, is the most precise machine in the world for measuring length. In spite of its sensitivity, this instrument is portable and simple to use; works from the interference fringes caused when a single wavelength of light is divided in two and then reunited. This fringe pattern is also seen when optical flats are used

INTERFERENCE MEASURING... ACCURATE WITHIN $\frac{1}{10,000,000}$ INCH

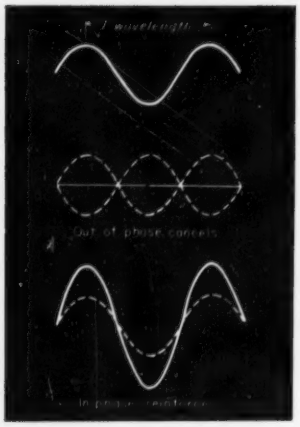
When tool and design engineers specify dimensional tolerances that split hairs, their demand can only be fulfilled by splitting light waves. Even these must be further divided before they are fully usable. It takes the world's most accurate measuring instrument

BY GEORGE WEBBER, President
WEBBER GAGE COMPANY, CLEVELAND, OHIO
—as told to DAVID DIETZ, SCIENCE WRITER

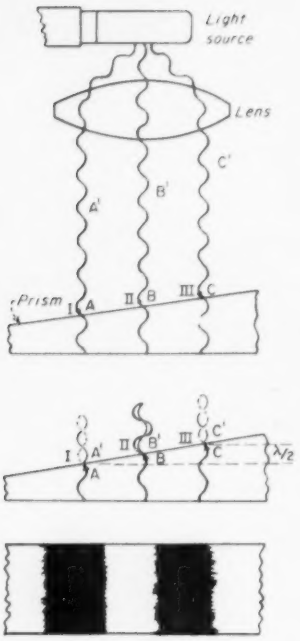
WHEN engineers speak of accuracy, degree must be defined. To some people a steel scale marked in increments of 1/64 in. is accurate. Many shop men believe the 0.0001-in. readings on their micrometers, especially when the mikes are regularly checked against gage blocks, and they consider this precise. While these instruments are more than satisfactory for most of the jobs they are required to perform, they are not really accurate. Accuracy is truth without a tolerance.

Steel scales, micrometers, and gage blocks measure by comparison. They only repeat the truth as it is conveyed to them, and then only to the best of their inherent ability. A tolerance must always be allowed.

Today, design engineers are asking production



LIGHT WAVE FORM is shown as a series of crests and troughs. When two waves meet out of phase, crest to trough, they cancel each other and the result is darkness. Two waves meeting in phase, crest to crest or trough to trough, reinforce each other to produce a brighter light. Depending upon the source of monochromatic (single color) light, wavelength is about 0.000023 in. It is always exactly the same for the same light



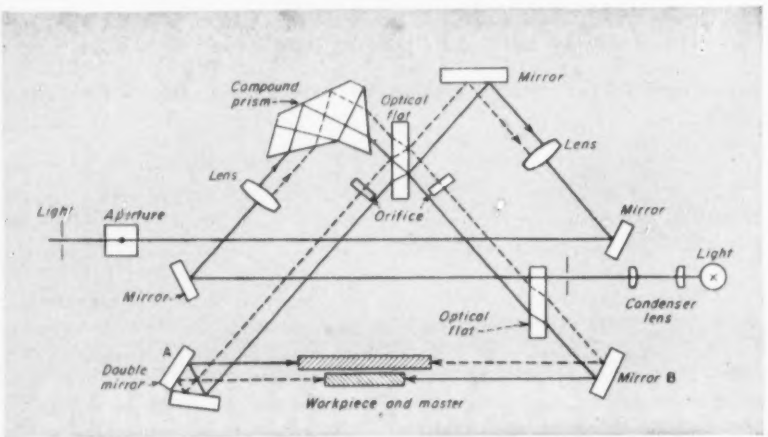
INTERFERENCE FRINGES are created, simply by focusing a parallel beam of monochromatic light on an optical glass wedge. While some of the light is reflected from the surface and some light passes through the wedge and is lost, a part of the light enters the wedge and is reflected from the lower surface. The rise of the wedge determines whether the two reflected rays meet at any point. If they meet in phase, they reinforce each other; meeting out of phase they cancel. The result is a series of light and dark bands, interference fringes. One band of darkness, defined by two bands of light, represents exactly one-half of the wavelength of the monochromatic light being used. The interferometer utilizes a half-silvered mirror rather than a glass wedge

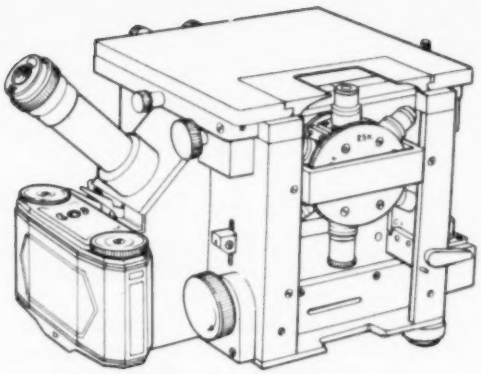
engineers to hold part dimensions within a tolerance of 0.000020 in. By the old rule of 10, then, working gage tolerances must be close to 0.000002 in. and gage block tolerances 0.0000002 in. This figure approaches accuracy. But how can dimensions this close be determined with certainty and how can they be transferred without distortion? Two conditions must be fulfilled. One task is to find a material having minimum variation and distortion, to serve as a positive transferring medium for the measurement. The other problem is to locate an absolute standard of measurable length, capable of application in this microscopic range.

After many years of searching, Webber Gage Co has found what it believes is the answer to both problems. With the cooperation of carbide manufacturers, an excellent transferring medium has been found. It is chrome carbide. Repeated tests have shown that chrome carbide has 30 times greater resistance to corrosion than other carbides and 10 times more resistance than 18-8 stainless steel. Gage blocks of this material can be handled without worry about perspiration stain or humid atmosphere. Chrome carbide has a coefficient of expansion very close to that of steel, hence temperature correction is less critical. Wear resistance is more than 50 times greater than for steel. Because of the highly polished surface that the extremely fine grain structure of chrome carbide permits, "wring factor" is so low that it usually can be neglected.

The search for an instrument that would provide an exact standard suitable for measuring to this de-

LIGHT PATHS in the new Zeiss interferometer compare the difference in length between two gage blocks. The optical system is such that the opposite ends of the gage blocks provide the same effect as the opposite surfaces of the glass wedge, when the latter is used to form interference fringes. However, the interferometer can measure the length of the blocks directly in terms of the light waves' length; it is not limited only to comparison. When this instrument is used as an absolute interferometer two additional mirrors are inserted in the system. One of these mirrors replaces the double mirror "A" and the second one is placed in front of mirror "B"





ZEISS INTERFERENCE MICROSCOPE uses the optical wedge principle to measure the quality of surface finish

gree of accuracy led to the Zeiss optical works in Germany. As a result, the Webber Gage Co now possesses the world's most precise instrument for the determination of length. It is the multiple-beam interferometer; is more exact than the earlier model interferometer at the National Bureau of Standards in Washington, DC. Until now, the latter has been the supreme court in the determination of gage-block accuracy.

When Diogenes searched for truth he carried a lamp. Modern science has found in *light* the answer to its quest for a standard of accuracy. The length of a single wave of monochromatic light, from the same source, is unchanging. Usually, the source is metallic ionization, of either sodium, mercury, or cadmium vapor. Commonly available sources produce light having a wavelength of 0.0000232 in. Two methods of utilizing this standard are available. One technique is found in "optical flats" and the other, more accurate, application uses the interferometer. A further refinement of the latter resulted in the multiple-beam interferometer.

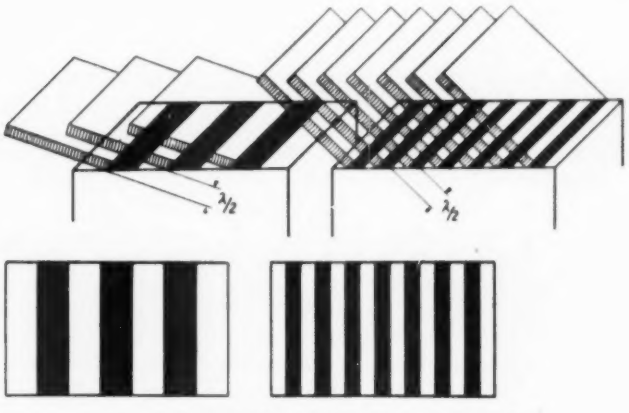
In 1881, the late Dr Albert A Michelson invented the interferometer. An experiment performed with this instrument in Cleveland during 1887 was the foundation on which Dr Albert Einstein developed his earth-shaking theory of relativity. The interferometer was used to determine whether the speed of light in different directions was affected by the earth's motion. The experiment did not show any difference and, on the basis of this finding, Einstein evolved his theory.

Through most of the intervening years, the interferometer has largely been a laboratory instrument. However, it is easy to use, compact, and readily portable; lends itself to industrial application.

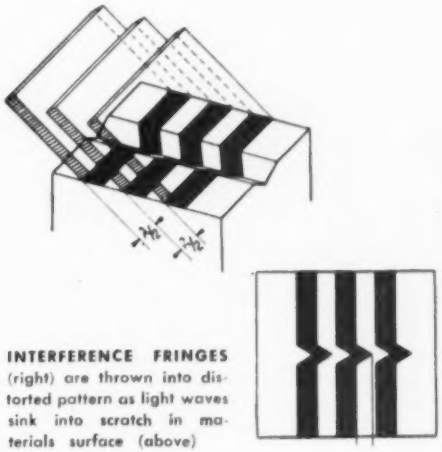
Interferometry is probably best known in the use of optical flats for determining the waviness of lapped metal surfaces and optical parts. When the optical flat is wrung to the surface of the piece to be examined and viewed in monochromatic light, a series of interference fringes (or light and dark bands) which follows the contour of the surface, is readily seen. These fringes are caused by interference between light beams reflected from the two surfaces in nominal contact. They occur at wedge thicknesses t given by the formula: $n\lambda = 2\mu t \cos \phi$, where n is the order of interference, λ the wavelength of monochromatic light, μ the refractive index of the wedge material, and ϕ the angle of incidence of the light. This expression reduces to: $t = n\lambda/2$, for normal incident light with air as the wedge material.

Fringe spacing, no matter what it may be, shows a constant half-wavelength difference in wedge thickness. Thus, a method of measurement sensitive to a few millionths of an inch is offered. However, this sensitivity still is not sufficiently exact to provide measurement to tenths of millionths. While these bands, representing perhaps 0.0000116 in. each, can be interpolated by eye, to provide smaller increments, this is only approximation. Accuracy demands definition.

Step number one is to narrow the band, or fringe line, and it is done by using multiple beams. Instead of one wavelength, three are used. As a result of the three different lengths, the waves interfere or en-



ANGLE OF LIGHT BEAM striking surface of optical flat influences character of interference pattern



INTERFERENCE FRINGES (right) are thrown into distorted pattern as light waves sink into scratch in materials surface (above)

ACCURACY WITHIN $\frac{1}{10,000,000}$ INCH—continued

force at more points; thus phase differences create finer fringe patterns. The second step uses an optical vernier to divide the lines into equal parts.

At the heart of the interferometer is a half-silvered mirror which splits a ray of light in two. When the two halves of the ray are reunited they form the pattern of light and dark "interference fringes" described. A change in one of the light paths equal to one ten-millionth of an inch can be detected in the shifting of the fringes.

The new interferometer at the Webber Gage Co is a triumph of the Zeiss optical experts. It differs from previous instruments in that the length of the gage block can be determined without wringing the block to a base plate. Measurements are made in three different wavelengths of monochromatic light: the red, the green, and the blue light of a cadmium lamp. Each color has its own exact wavelength and this length is determined from the position of the particular band of light in the spectrum.

Using the new instrument, it is possible to calibrate or determine the exact length of master gage blocks by direct comparison with the wavelength of light rather than by comparing them with other gage blocks.

To count the number of interference fringes in a length of only ⅜ in. would involve nearly 30,000 bands. This is impractical. Accordingly, the Zeiss experts devised a short-cut utilizing the three different colors. The instrument produces two systems of interference bands, one generated by the comparison mirror and the base plate and the other evolved by the comparison mirror and the gage block surface being measured. It is only necessary to read the displacement of the two systems on a scale for each of the three colors. Then these readings are transferred to a special slide rule and the length, accurate within 0.0000001 in., is read at once.

GAGE BLOCK SELECTION

Webber Gage Co, the largest exclusive gage block maker in the world, manufactures two grades of steel gage blocks. One of these grades is accurate within 0.000008 in. per in. and the better quality is true within 0.000004 in. per in. Optical tests are used to assure absolutely flat and parallel surfaces. If these blocks were measured with the interferometer, it would be like measuring a brick with a micrometer. The major trouble with steel is the difficulty of polishing it with a soft lap. Using the soft lap, it is not possible to get a surface beyond a certain stage of perfection. On the other hand, a hard lap produces a superior size but its abrasive action scratches the surfaces of steel blocks. Thus the fine grain structure and extreme hardness of chrome carbide permit polishing to a perfection not obtainable with steel.

While steel blocks are satisfactory for most gaging purposes, the shop that requires the best is wise to switch to chrome-carbide blocks. At least, the more commonly used blocks, that wear rapidly, should be replaced with the new material. Although chrome-carbide blocks cost four times as much as steel blocks, they last 50 times as long.

TOOLING IS THE KEY TO SINTERED-IRON CAMS

BY A I ALSTROM, Engineering Dept, WICO ELECTRIC COMPANY, West Springfield, Mass

Several years ago, we began our changeover to sintered-iron cams on our flywheel-type magneto, primarily to save cost. We had been using cams made from hardened steel, ground on our Norton cam grinders. We found that the ordinary sintered-iron material did not give us as long life as the steel cam, but with special materials pressed to reduce the porosity as much as possible, we were able to just about duplicate the life of the steel cam.

One problem in manufacture is to obtain the proper cam contour and to get this contour in proper relation to the keyway so the magneto will be properly timed. Having developed master cams for our Norton cam grinders, we work very closely with our supplier who manufactures the tools. After design of his tools is worked out, he checks with us to determine that the upper and lower punches will fit in our cam grinders. After he has made the blanks for these punches and also blanks for lapping out the die barrel, they are sent to us and we grind the cam contour onto these blanks in proper relationship to maintain the timing. In this manner, we get the contour we need in the right place.

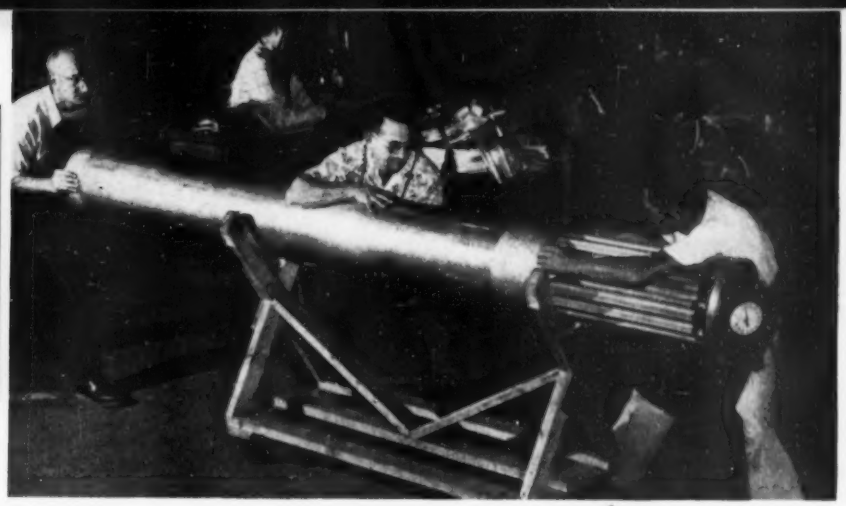
We found that if an ordinary steel die barrel were used, it could gall enough to form ridges on the cam, which would cause rapid wear of the cam follower. To get around this, we have been using die barrels made of tungsten carbide which are finally lapped to size with the laps ground on our cam grinder. It is of course important that a very smooth finish be obtained on the outside surface of this cam, which rides against the follower.

When we have cams of the same OD but with different hole sizes and keyway positions, we are able to make interchangeable dies using the same die barrel by making punches and core rods to suit.

We are now working on another idea — making a sintered-iron blank which would be round on the OD. We'd then grind the contour on this blank to the size and position that we require. Our object in doing this is to get a cheap blank for use on the small-volume cams where it is not economically sound to spend the money required for complete tools.

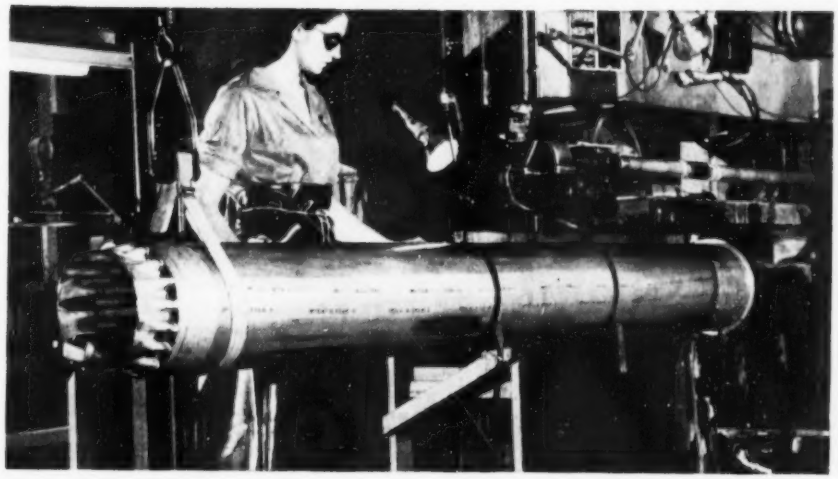
SHOP SHOTS

ON TUBE-WORKING FROM SAN DIEGO



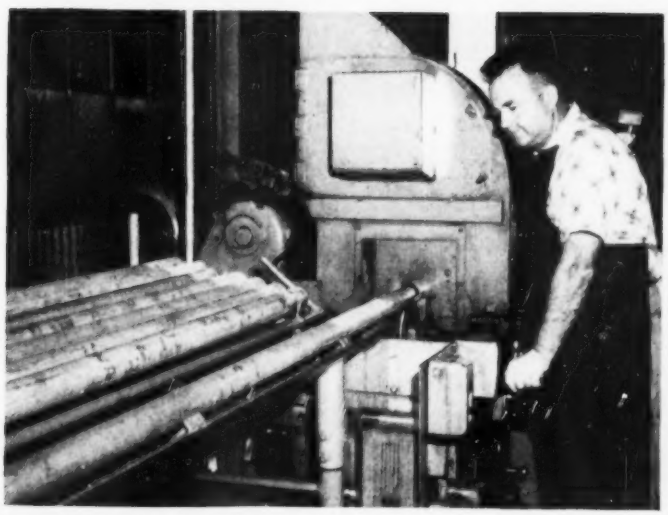
AT SOLAR AIRCRAFT

VACUUM IS APPLIED to corrugated tube with a 12½-in. dia, shrinking it to about 11⅝ in., so it can be slipped inside 12-in. outer shroud. Wooden fixture inside prevents collapse; rubber-faced plate on each end fits over tube to seal it. After assembly, positive pressure expands tube for tight fit



ASSEMBLED AUGMENTOR, which cools engine and produces cabin heat in Convair 240 airliner, is indirect-welded for seal. Completed unit also provides heat for de-icing and gives slight jet assist to reciprocating engines

AT RYAN AERONAUTICAL



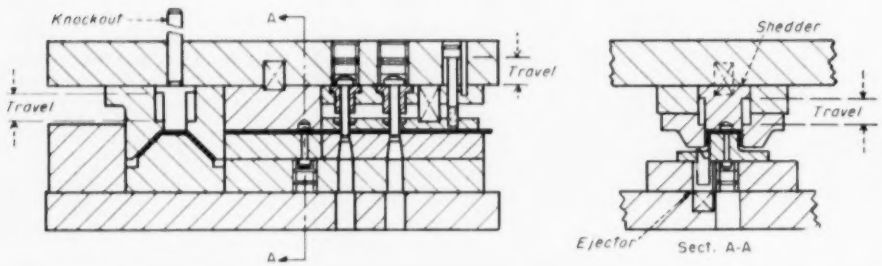
TUBE LENGTHS ARE CUT by Campbell abrasive-wheel machine that trims about 1000 pcs in an 8-hr shift, the same time formerly taken for the same production by four tube-cutting lathes. Work clamping is hydraulic, cutting is aided by heavy coolant flow. Stock is originally 20-ft lengths, cut to lengths from 1 to 17 in. which will be parts of ball-and-socket joints, nipples, and sleeves for exhaust systems

SHORT LENGTHS ARE DEBURRED by tumbling at cost of 2c each, as against old cost of about 8c for hand work with files and emery

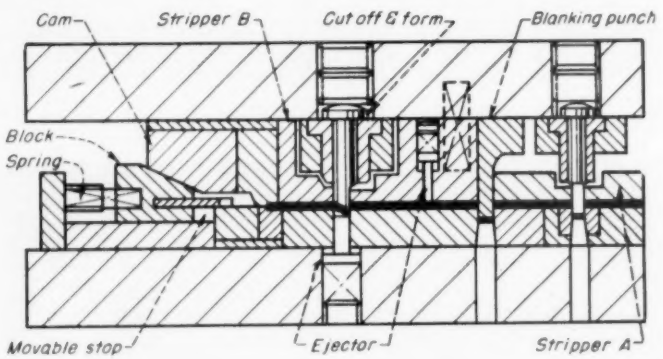
Progressive dies require little maintenance

Combining operations in a progressive manner reduces labor. By good design, complicated bends, forms and small draws can be made

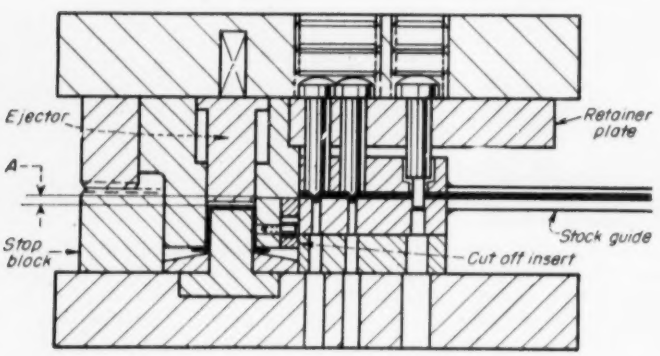
By PETER BALSELLS, Tool Engineer



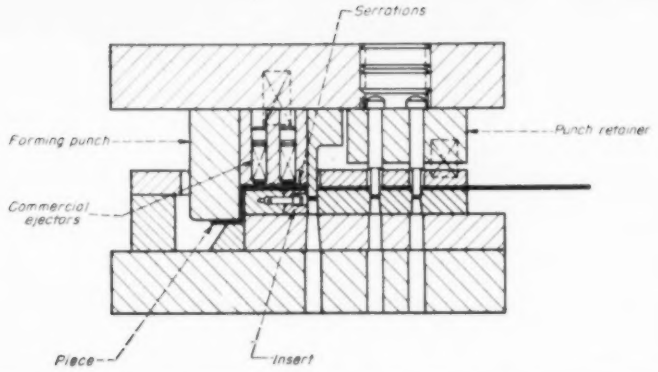
Part with two forms is made complete: (1) pierce two holes and notch two edges; (2) form the piece down and extrusion up, and (3) cut off and form completed piece. Shedder at second station bottoms to make extrusion and holds stock firmly during cutoff



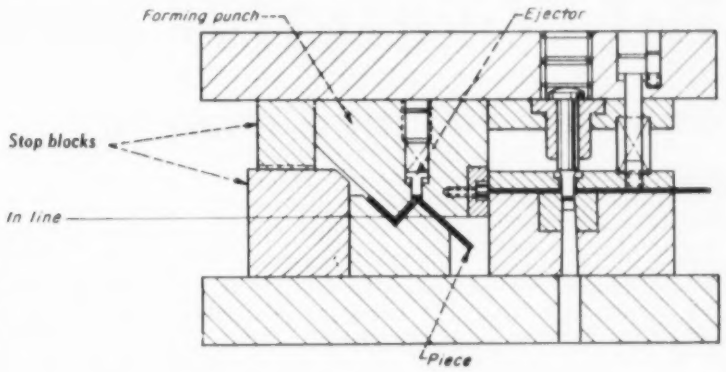
Coining is performed at cutoff. After piercing, a small slug is blanked. Next the material is cut off and formed, while the opposite edge of the piece is coined. Piercing and blanking punches are supported in quills. Stripper *B* flattens the stock and gives good support to the cut-off and coining punches. Movable stock stop positions the strip when die is open, is forced back out of the way of the coining punch by the cam on punch-holder



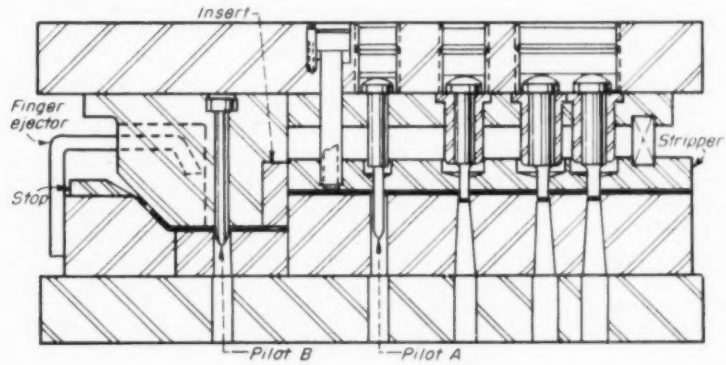
Two-station die pierces and forms protrusions at first station; cuts off and forms at the second. Dimension *A* should be equal to or slightly greater than stock thickness. Thus, in shut position the punch will come a stock thickness below the cut-off edge. The piece will not have a tendency to move or pull out and destroy proper forming. Cut-off insert has an elongated slot to compensate for grinding



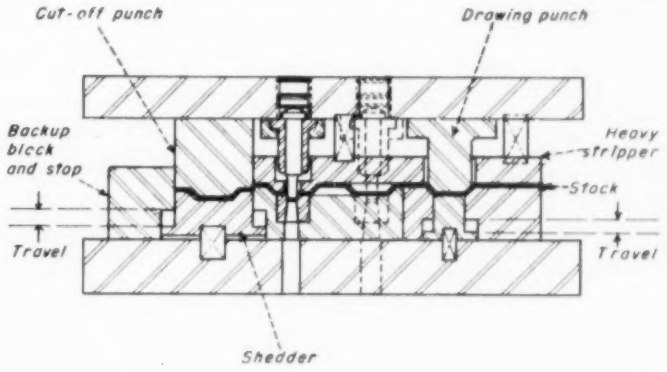
Unsatisfactory results are obtained with this construction. The stock has a tendency to pull out during forming, despite serrations on the stripper and a heavy spring



Better design of a two-station pierce, cut-off and form die involves placing the lower end of the cut-off insert and the lower end of the top forming punch in line. These two surfaces contact the stock simultaneously, so that it does not move while being cut off. Rigid stop blocks are required to take side thrust of the punches



Two pilots are used in this three-station die. At the first station, three holes are pierced by quill-mounted punches. Pilot *A* at station two is located ahead of notching punches (not shown) to position the stock properly. At the third station, the strip hits a stop and one of the pierced holes is picked up by pilot *B* to locate the material before and during cut-off and forming. A stationary finger ejector removes the piece after it is formed



Where depth of draw is small, it is not necessary to slot the stock around the part to take care of material flow. Drawing is done at the first station. Four holes are pieced at stations two and three, because the holes are close together. Spring-loaded disappearing pins (not shown) raise the stock so that it can be moved to the last station for cut-off. The cut-off punch has a spring-actuated ejector, not shown

What do you do when one
of your workers starts to go sour,
when office morale starts to sag,
when production drops off?
Here are some key points
to remember when you hold . . .

THE CORRECTIVE INTERVIEW...

one key to good morale

BY DONALD J WOOD

No matter how well-run your organization is, there will always be a time when something goes sour, and you have to find out what's wrong. As often as not, you will find that some person, who until now has been doing a good job, is causing the trouble. When this happens, it is time for what may be called the "corrective interview."

During such a discussion you may succeed or fail in rebuilding a well-knit work force, so it would be a good idea to review a few of the rules which may help make the interview succeed.

I. DON'T CORRECT IN PUBLIC

Often a supervisor, hearing of a mistake an employee has made, charges out onto the production floor and, when he finds the offender, begins a loud tirade.

There is no point to this. If you publicly criticize the people who work for you, it won't be long until your habit is generally known and talked about. Then your public reprimand becomes either a joke talked about behind your back, or a matter of public sympathy, with the workers banded together against you. In either case your corrective measures lose their effect, which is exactly what you don't want.

If you had held the interview in private, it is more than likely that the employee would not advertise the fact. His pride would be at stake. Thus you have gained two ways. You have kept some meaning in the reprimand, and you have kept the respect of the employee by thinking of his feelings.

II. KEEP THE VIEWPOINT OF THE WORKER

If you're interested in keeping good morale, you must realize that the worker has the same feelings you do. There may be some important personal reason for his suddenly going sour—it happens to all of us, so let him do most of the talking. He knows what went wrong, and, presumably, that's what you want to find out.

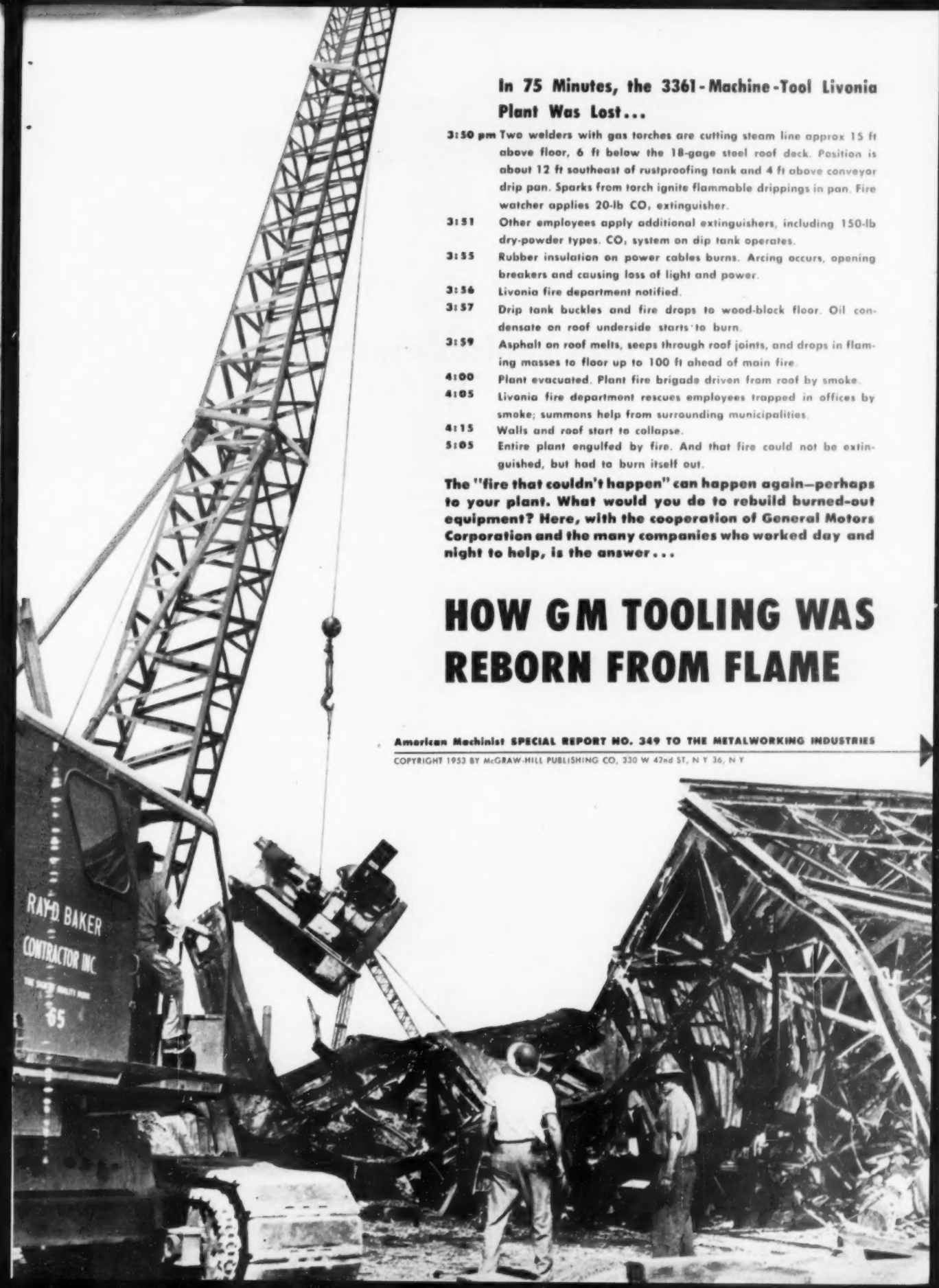
If you don't think he's worth the trouble, fire him, but you should be fairly careful when you do this. You ought to know the man well enough if he's worth his pay, without waiting for something to go wrong. (Automatic personnel rating plans help you keep a true idea of the man's over-all worth to you.)

The "tone" of the interview is important. Many supervisors, when face-to-face with a dissatisfied worker, adopt a fatherly manner. Shop employees resent a paternal attitude on the part of management, because it is common knowledge that the shop is in business to make money. It is not realistic to expect a man to think otherwise on the rare occasion of the corrective interview.

III. JUDGE SLOWLY

After the man has gone back to his job, take your time about deciding what is wrong. A cardinal rule is always to find the reason behind each problem and adjust the correction to the individual. Once the man has been allowed to talk, the supervisor thinks over all the evidence, then selects a fair plan for improvement. The worker should be given credit for his strong points when you are weighing his usefulness. If his faults are too great to let him stay where he is, you may easily be able to put his strength to work somewhere else.

As you can see, a corrective interview is not easy to conduct. Skill and tact are needed, with the realization that a worker's good will is one of a company's most valuable assets.



In 75 Minutes, the 3361-Machine-Tool Livonia Plant Was Lost...

3:50 pm Two welders with gas torches are cutting steam line approx 15 ft above floor, 6 ft below the 18-gage steel roof deck. Position is about 12 ft southeast of rustproofing tank and 4 ft above conveyor drip pan. Sparks from torch ignite flammable drippings in pan. Fire watcher applies 20-lb CO_2 extinguisher.

3:51 Other employees apply additional extinguishers, including 150-lb dry-powder types. CO_2 system on dip tank operates.

3:55 Rubber insulation on power cables burns. Arcing occurs, opening breakers and causing loss of light and power.

3:56 Livonia fire department notified.

3:57 Drip tank buckles and fire drops to wood-block floor. Oil condensate on roof underside starts to burn.

3:59 Asphalt on roof melts, seeps through roof joints, and drops in flaming masses to floor up to 100 ft ahead of main fire.

4:00 Plant evacuated. Plant fire brigade driven from roof by smoke.

4:05 Livonia fire department rescues employees trapped in offices by smoke; summons help from surrounding municipalities.

4:15 Walls and roof start to collapse.

5:05 Entire plant engulfed by fire. And that fire could not be extinguished, but had to burn itself out.

The "fire that couldn't happen" can happen again—perhaps to your plant. What would you do to rebuild burned-out equipment? Here, with the cooperation of General Motors Corporation and the many companies who worked day and night to help, is the answer...

HOW GM TOOLING WAS REBORN FROM FLAME

American Machinist SPECIAL REPORT NO. 349 TO THE METALWORKING INDUSTRIES

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'the fire that couldn't happen'

"All the water in the Detroit river, could not have stemmed the fire that destroyed the General Motors Livonia plant," said one fire chief at the scene. Yet, it was designed and built to comply with every known fire law. Confidence in the thoroughness with which this plant was built rated it as "a safe place to work." The minimum loss in human life bears out the truth of the statement. But the fire, "the fire that couldn't happen," nevertheless took its toll. Production of automatic transmissions was wiped out, thousands of employees were left temporarily jobless, and all that remained of a once-proud plant was a mass of twisted steel and machines seemingly reduced to junk.

The significance of this catastrophe should not be too quickly dismissed by anyone, especially those who, regardless of position, earn their livelihood in industry. For industry is the backbone of our country and as such is hardest hit when disaster strikes. Disaster comes in many forms—and with present world conditions, can we afford to discount sabotage or an enemy bombing?

Think—for this could happen to you — are you prepared to cope with the hardship wrought by a disaster? Have you organized a disaster team? Are you a member of this team?

Regardless of the nature and severity of the disaster, following it there will always be the inevitable questions. How do we reorganize? What do we do first? When can we get back in production, recall our employees?

Here is how General Motors organized to meet these questions: (This program was initiated August 12, 1953)

"OPERATION HYDRA-MATIC"

During the fire, panic was absent. In its place, clear-headed practical decisions were being formulated by General Motors executives. When it became apparent that the plant was doomed, they requested the fire departments to concentrate their efforts and hose lines on designated sections of the plant containing the more valuable machines. While the fire was still raging, plans were made for a reorganization program which GM confidently felt would put the transmission back in production with minimum loss of time.

Headquarters for this program was established in the unscathed offices and garage, adjacent to main plant. Here were the more important questions requiring immediate action:

1. Provide for sub-contracting over 400 Hydra-Matic parts to GM divisions and outside jobbers.
2. Set up limited assembly at the Riopelle plant (original home of Hydra-Matic).
3. Secure 2-yr lease on an available plant for full scale production.
4. Outline tentative schedule with a timetable. Goal: meet schedule, sacrifice cost.
5. Target: back in production and recall employees as soon as possible.

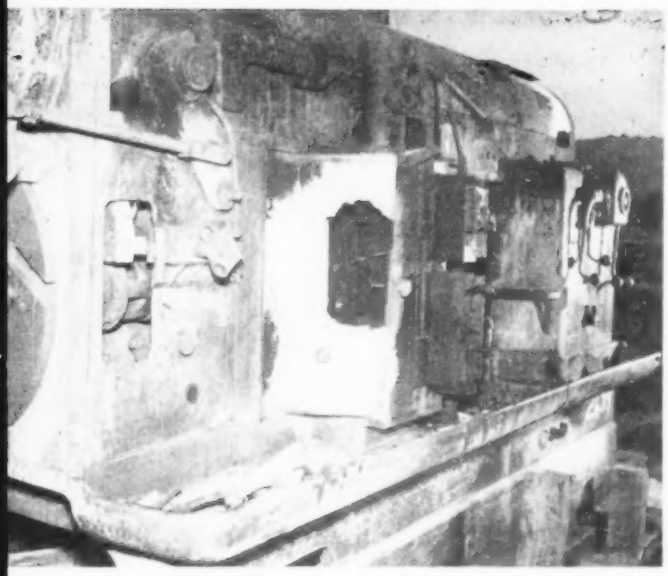
To meet the demands imposed by this program, some 250 key men were called in from other GM divisions. It was decided that the success of this plan could be best guaranteed by establishing teams to handle individual phases of the over-all program and by holding executive conferences every day, 7 days a week, until the entire operation was capable of carrying itself.

Negotiations were completed with the Kaiser Motors Corp to lease 1,500,000 sq ft of the Willow Run plant.

Simultaneously, outside salvage contractors were at work clearing the destroyed plant of over 3361 machines. They worked through the nights during salvage operations aided by scores of floodlights which consumed over 675,000 watts.

"Operation Hydra-Matic" was aided by 40 rehabilitation teams, 29 for production departments and 11 for non-production departments.

The general manager was the key man and placed at the head of the entire operation. Answering di-



NOTE ALUMINUM GEAR CORNER on 6 spindle Conomatic. Lower base of this machine was cracked in a non-critical area and was salvaged by arc welding and remachining to new machine standards

MACHINE CASTINGS CRACKED in critical areas, as is the lower base of this Conomatic, were replaced

rectly to him were seven divisions each charged with its particular responsibility, namely:

1. Quality Control

The inspection department was given the responsibility of quality control for the fabrication of transmissions parts by outside vendors, so that the parts, when received, would selectively fit into assemblies at the Riopelle plant. Daily progress reports on outside vendor production were forwarded to the Purchasing Department. Seven control teams were assigned to cover the geographical manufacturing areas of Buffalo, Cleveland, Dayton, Detroit (3 subdivisions), and Indianapolis. Each of the teams consisted of a supervisor, statistical quality-control representative, and qualified inspectors.

2. Master Mechanic

The outside master mechanic and team captain checked the condition of equipment and made the initial determination of its salvagability. The master mechanic was also responsible for determining location and availability of sources to rebuild or replace the equipment.

3. Plant Preparation

GM's Argonaut Realty Division was given this assignment. It leased the Willow Run plant, and supervised removal of machines and equipment from Livonia. It was further responsible for any construction work required, including planning and installation of electricity, gas, water, ventilation, waste disposal, coolant and steam systems at Willow Run.

4. Plant Layout

The plant engineer and his staff from the Detroit Transmission Divison were responsible for the location of machines and equipment at the Willow Run plant.

AT FIRST INSPECTION, many machines looked like junk. Typical is this Bullard vertical turret lathe. However, closer inspection and disassembly showed they could be restored to working condition

5. Labor Pool

The Employment Office "Labor Pool" handled hiring, callbacks, and other usual personnel functions. Certain regulations had to be set up to take seniority into consideration.

6. Purchasing and Expediting

The purchasing department supervised the sub-

contracting of all transmission parts (previously made at Livonia) to other GM divisions and outside companies. They arranged the purchase of machines, tools and supplies as needed. More than 30 field engineers were assigned from this department to cover specific territories, to check the progress of every machine shipped to their area for rehabilitation, as well as deliveries of new machines. In addition, they were responsible for trouble shooting problems arising from the rebuilding of machines, tooling, and piece parts. Daily progress reports as well as requests for GM tool and piece part drawings were forwarded to Detroit headquarters.

7. Traffic

This department had control of all inbound and outbound traffic and was responsible for providing through transportation facilities at all times for the prompt removal of the burned machines and enroute by rail or truck to the machine-tool builder.

Each division in turn was serviced by the rehabilitation teams responsible for unit Hydra-Matic components. Teams were headed by eight key men:

1. Captain (general foreman)
2. Master Mechanic
3. Material Control Man
4. Inspector
5. Plant Engineer
6. Process Representative
7. Engineering Representative
8. Plant Layout

Hydra-Matic component teams formed the following divisions:

1. Gear
2. Case
3. Control
4. Assembly
5. Non-productive

CAPTAIN—MASTER MECHANIC

As the machines were assigned to a given departmental team, the master mechanic and team captain would determine whether its condition warranted rebuilding, was questionable, or rated it as just plain scrap. If any of the machines were borderline cases, a committee headed by the chief master mechanic would review the equipment and when the original machine-tool builder was available his opinion entered into the final decision. Many of these builders and suppliers voluntarily came to the scene of the disaster to offer their services and assistance to General Motors.

MATERIAL CONTROL REPRESENTATIVE

Responsible for handling of production parts removed from the Livonia plant.

INSPECTOR

The inspector checked the condition of gages and inspection equipment, issued orders for restoration of items that were salvagable, and ordered new equipment for replacement of items that were scrap. Over 12,000 precision gages of all types were involved in the fire. He also determined the usability of transmission parts recovered from stores.

PLANT ENGINEER

The plant engineer was responsible for arranging for installation of rebuilt and new machines and equipment necessary for the production of transmission parts in his department at the Willow Run plant.

PROCESS REPRESENTATIVE

The team's Process representative checked the condition of tools and initiated orders for rebuilding any new equipment when necessary. He also issued tool drawings and provided sources of supply for new or replacement tooling.

ENGINEERING REPRESENTATIVE

The engineering representatives assisted in supply-

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how to repair burned-

Many machine-tool builders, tool and die plants, as well as other GM plants, did a remarkable job in speedily repairing fire-damaged units from Livonia. From their experience, we have here distilled the essence of the task, the basic procedures and variations. These case studies show just what to do, under any given set of conditions, to rebuild a burned machine tool.

Several general points should be made at once:

1. **Time is the vital factor.** The knocked-out plant must be gotten back into production as quickly as possible. This may make it advisable to rebuild when it would be almost as cheap to replace — because to replace would take longer. Conversely, if new units are readily available, a careful survey should be made to see if the burned machine is worth the necessary salvaging effort, except that:

2. **Don't forget the tax situation.** A machine on which some depreciation has been taken can be repaired in emergency, and the cost of all repairs charged off to current operating expense, while a new replacement would require setting up a new capital account and re-depreciation from full cost price. Thus current tax laws favor rebuilding.

3. **Emergency offers no time for paperwork.** In this case, most rebuilding jobs were undertaken without anything more than a verbal agreement between GM and the rebuilder. In a pinch, even our paper-ridden business procedure can be short-circuited.

4. **Don't keep tool drawings too near the tooling.** If the tooling goes up in smoke, be sure the drawings

ing technical information required by the rebuilding sources.

PLANT LAYOUT

The plant layout representative works with other team members in planning departmental layouts and tying them in with the overall plant layout. The layout man keeps the departmental layout up to date by including changes caused by necessary alterations in the machine lineups, etc.

At first glance, many of the machines looked beyond salvage. However, the final tally showed, as the last machine was shipped from GM on Aug. 26 —two weeks to the hour after the fire—that less than 1000 machines were scrapped. A good portion of these machines were set aside in a special area for a GM "cannibalization" program.

Standing by to receive the machines for rebuilding were 296 vendors in 87 cities located in 17 states.

More than 12,000 motors were more or less burned out and immediate steps were taken to notify suppliers for replacements on emergency deliveries.

To conserve time and lessen as much as possible the burden on machine-tool builders, GM set up in its local divisions and the Willow Run plant, a rebuilding program of their own. 350 skilled men were hired to rebuild machines, tooling, and gaging equipment not too seriously damaged. Eventually this same program will include replacing tooling which was lost or destroyed. These journeymen include toolmakers, instrument makers, gage makers, jig borers, tool-room machine operators, set-up men and machine repair men.

As a temporary measure to relieve the pressure of new machine deliveries beyond the timetable schedule, particularly for specialized machine tools, several machine sources were exploited.

1. Engineers were assigned to the European market to purchase American hobbing, boring, grinding and chucking machines in English, Swedish, and German pools.

2. Another group set out to explore the used-machine market in this country for duplicate replacement of the specialized equipment, or for the purchase of single-operation machines to take their place.

Every member of the GM "Operation Hydra-Matic" program took up the challenge and for the first three weeks following the disaster worked 12 hours a day, seven days a week. Part of the credit for the fine spirit of cooperation towards a common goal should be credited to the labor unions, representing the GM employees, who did their utmost to get the job done.

Construction work is progressing rapidly at Willow Run with conveyor lines, a mile and half of work benches, 1000 stools, 30 platform trucks and 75 shop desks received and installed.

Machine-tool builders by Nov 1 had shipped back some 1545 rebuilt machines of the total 2196 shipped them from the Livonia fire. As rebuilt machines reach Willow Run, little time is lost installing them in the area designated by plant layout. So systematically has this operation been progressing that many departments can now be readily identified.

Once the Willow Run plant begins production, the original command line setup will take over under the varous departments. It will only be then that GM engineers will decide how to rebuild the Livonia plant, but there is no doubt in their minds that it will be rebuilt. Only time will tell what design changes GM will incorporate in the new building as a result of the Livonia disaster.

However, right now, one thing is sure: whether you are a member of a large or small industrial organization, you can take advantage of the lesson to be learned from GM's experience with disaster. Regardless of your size, YOU can modify "Operation Hydra-Matic" to suit your needs.

out machines

are safely at some distance, yet are current. Germany learned this the hard way through bomb attacks.

5. **Keep tool drawing and records up to date.** Replacing tooling was difficult because some suppliers did not have drawings reflecting latest revisions.

BASIC SALVAGE STEPS

1. Before any attempts were made to tear the machines down, the heavy "crud," a combination of tar, concrete, oil and chips, had to be scraped free. Aluminum and glass, which had melted during the fire and ran into slots and moving components of the machine, had to be chipped off in many cases.

2. Following this operation, the combination of a steam jenny, detergents, rotary wire brushes, emery cloth and hand scrapers was used to remove the final stubborn residue from machine ways and moving parts.

3. It was then possible to strip motors, control panels, coolant pumps, chucks, and air cylinders from the machines.

4. Final cleaning was done by sandblasting and snagging after all machine ways, spindles, shafts and vital parts were masked. In some instances, after this operation, cracks previously undetected in critical areas of the machine were visible—in which case the component was scrapped.

5. Immediately following sand blasting, the machine received a prime coat of paint; otherwise surfaces would have oxidized instantly.

At this stage, final dismantling of the machine was undertaken. It presented the biggest problem because

spindles, shafts, bearings, bushings, pistons and pulleys were seized or fused together from the intense heat. In some cases they were locked as one piece, where the molten aluminum had seeped in and solidified. It was also discovered that those machines using straight cutting oils were more seriously burned out.

FREEING PARTS

Several techniques were used to free these parts from their housings and the machines. Depending on the problem at hand, they varied thus:

1. Spindles, shafts and pulleys were removed by a combination of penetrating oil, heat and hydraulic jacks or gear pullers.

2. Frozen bushings and pulleys which refused to budge were not reuseable so were destroyed to salvage more vital parts and to prevent cracking the cast-iron housings and beds in which they were seated. Several methods were employed:

a. A series of holes were drilled in the bushings, then they were chipped out (Hardened bushings were sufficiently annealed by the fire to permit drilling).

b. Pulleys were cut off by using either hacksaws, cutting torches, or the drilling technique.

3. The majority of outer races for ball and roller bearings were freed as outlined in Step 1. However, some outer races expanded considerably within the bores and rather than run the risk of further damaging the integral spindles and quills, the cast-iron housings were slotted on a milling machine and the sections peeled off.

4. Bushings, liners and bearing races that were seized to spindles and shafts were turned off with carbide-tipped tools.

5. Spindles and shafts not too badly bent were first polished with emery cloth in a high-speed lathe. They were then straightened in either an arbor press, lathe or standard straightening press. In every case, they were restored to new-equipment tolerances for alignment and concentricity.

When spindles could not be salvaged by straightening alone, bearing surfaces were ground undersize, chrome-plated and reground to original tolerances. (Skin thickness of chrome plating on reground spindles was held to 0.006 to 0.008 in.) This same technique was used in some instances for salvaging bushings, liners, plungers, pistons and work-holding chucks.

6. More-seriously damaged chucks, air cylinders and coolant pumps were returned to the original suppliers for salvage. The rest were soaked for 12 hr in penetrating oil, taken apart, vapor-honed, and cleaned in mineral spirits. Worn and damaged parts were replaced with stock items when available; otherwise the builder would turn out new parts or utilize the plating technique.

7. If a machine bed, saddle, bridge or housing was cracked in a non-critical area, it was repaired by arc welding. To avoid stresses, warping and additional growth, intermittent welding operations were performed on the various pieces of equipment. During these stages, the heat was minimized by limiting the length of the welding bead to 1 in. As an additional precaution, portable pyrometers were used to indicate the temperature adjacent to the welding area (max 125F). While this area was allowed to cool, the welder took up another position. It was found that either a ⅛-in.-dia N1 ≠51 or Eutectic welding rod performed best for this application.

8. Machine beds, tables, saddles, bridges, etc, which were warped and could not be straightened by hand scraping alone, were remachined. They were then hand-scraped together in mating pairs or scraped in to a master. In either case, new-machine step heights and tolerances were maintained. The average machine casting was warped anywhere from 0.010 to 0.030 in., some as high as 0.125 in.

"OPERATION HYDRA-MATIC" was a tough rush job of a kind few companies face. Yet it was done masterfully by ingenuity and plain hard work. General Motors executives have been unstinting in their praise for machine-tool builders and suppliers who superimposed this emergency work on top of overtime schedules, planning organizational programs before they even knew exactly what was coming. Preceding paragraphs have outlined the general procedure; in succeeding pages we will attempt to show typical case studies and vital variations. Limited space and duplication between companies have made it necessary to confine this digest to typical examples from a great array of material supplied in response to our urgent request.

TURNING

FIND AND PREPARE REBUILDING AREA

Special steps in repairing turning equipment may be epitomized by the case of Jones & Lamson Machine Company. Two days after the fire, J & L was notified that machines were on the way. Obviously, no disaster team existed—so one was set up at once, headed by the Chief Process Engineer, a step taken by many other builders as well. First steps were these:

1. **Lease of an available area to house the special program.** A vacant 2-story textile-processing building served by a railroad was leased near the main plant.

2. **Provide necessary power and utilities.** Three

9. Misalignment of machine bores, whether from the fire or as a result of functional wear, was corrected by reboring. Bores were fitted with oversize bushings or metal-sprayed and reground to their original size.

10. Intricate machine parts and tooling were cleaned by vapor-honing or ball shot depending on the nature of the part and its size. Final cleaning was accomplished by vapor degreasing or a bath in mineral spirits.

11. Hardened parts, annealed by the intense heat, were as a general rule scrapped. Many were salvaged, however, if functional requirements permitted, by flame hardening and reworking. Parts originally hardened to R. 61-65 were annealed by the intense heat to R. 45-48.

12. Those machine items that were automatically scrapped included over 12,000 motors, precision bearings, electrical control panels and wiring, hydraulic systems, hardened cutter spindles, precision gears, universal joints, and instrument panels.

13. As a general rule, when salvageable parts were stripped from a machine, they were tagged with metal disks for identification.

14. Reworking the tooling proved quite a handicap because it was either so badly burned that it could not be identified, or for any number of reasons the tooling was lost at Livonia. In any case the machine-tool builder was responsible for restoring the tooling and as a result he required GM tool drawings. This posed a difficult problem for it was discovered that in some cases the drawings did not indicate the latest revisions from the time that the machine was originally tooled. Although none of the tool drawings were destroyed in the fire, it is particularly significant to note the importance of keeping all of them up to date, as considerable confusion and lost time resulted from this oversight.

15. Assembling the machines did not present any particular problem because this was a routine procedure, carried out with the same processes and diligence accorded new equipment. Alignment of spindles to bed and tailstock, concentricity, runout, ease of operation, flatness and parallelism of ways, time cycles and indexing were checked out to new-machine tolerances. Without exception, every rebuilt machine was within 95 to 100% of new-machine specifications. Another noteworthy development that took place in the case of many machines 10 to 15 years old was that they were rebuilt and equipped with the latest design features of present-day machines. The builders voluntarily made this gesture for two good reasons: First, original components were obsolete and therefore not readily available. Second, to fulfill GM's wishes by restoring the equipment to as good a working condition as possible.

16. Surface finishes of the machine were generally one of two types. Where scheduling permitted, the machine castings were filled and rubbed, followed by applying prime and enamel coats of paint to the entire framework. Otherwise, to conserve time, they received several coats of prime paint followed with a spatter finish.

17. Final check-out and certification of all machines and tooling were accomplished thus:

a. They were run and tested to the break-in standards and specifications set up for new machines. As an additional precaution, specialized and highly precise equipment were run in for twice the number of hours required for certification.

b. Test pieces, for which the machine was tooled, were fabricated and checked against GM's part drawings. These parts were shipped along with the machine when it was returned to Willow Run.

(General Motors work at Willow Run is pictured on page 149)

AND BORING

special transformers were set up outside to provide 440-volt power. Additional 110-volt lines and outlets for hand tools and portable equipment were installed. Pedestal tool grinders, belt sanders and polishers, electric and air drills, and an electric winch were begged or borrowed from the parent plant or other local plants. A "dead man" was set up to lift machines from flat cars (on which they were shipped) into the building. It was based in the plant foundation, equipped with the electric winch, and served by platform skids and 4-in. wooden rolls. Inside movement of machines was handled by fork truck.

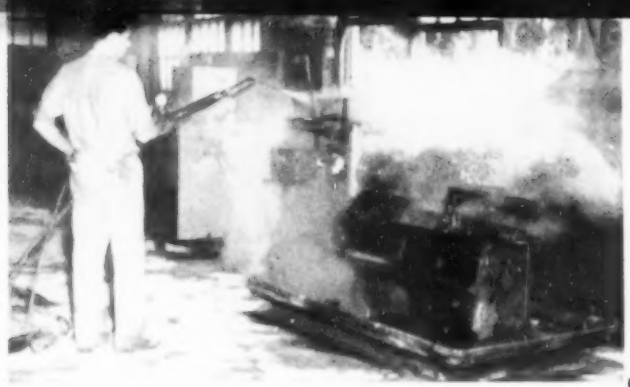
3. Organize a force of 50 men for the 60-machine program. Foremen and setup men were drafted from the parent plant to instruct and direct new employees hired through advertising in local newspapers. A few were experienced, but many were green hands. They worked a 10-hr day, six days a week. Some 50% are expected to become permanent J & L employees. Equipment to be rebuilt included Fay automatics, thread grinders, and comparators. All machine tools proved salvageable, but comparators proved on close inspection to be scrap—aluminum verniers and accessories, lenses, and mirrors had melted to puddles.

PS: Pleasant surprise—the discovery that the leased plant has real potential to fit into J & L expansion plans.

TYPICAL OF THE SEQUENCE OF REBUILDING OPERATIONS OF MANY MACHINE-TOOL BUILDERS ARE THESE PHOTOS OF OPERATIONS AT ONE PLANT

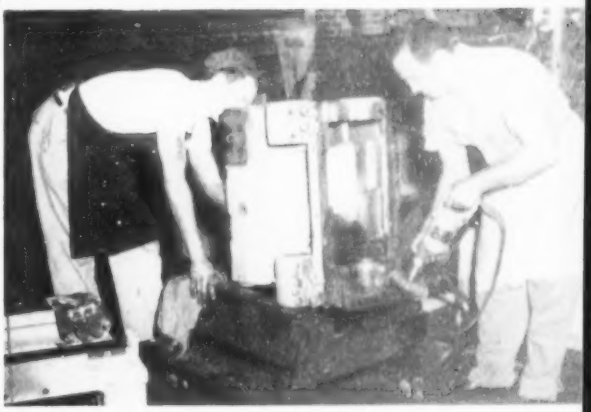
AN IDLE TEXTILE PLANT containing over 16,000 sq ft of floor space was leased by Jones & Lamson. It was set up to handle the rebuilding program: 440- and 110-volt power was run in, and an air compressor, lift truck, steam jenny, and two hoist bridges rented to start operations

FROM THE MAIN PLANT, chain falls, portable crane frames, a degreaser, vapor hones, spray booth, heating and exhaust units, spare parts, drillpresses, lathes, arbor presses, inspection equipment, and many other tools were requisitioned



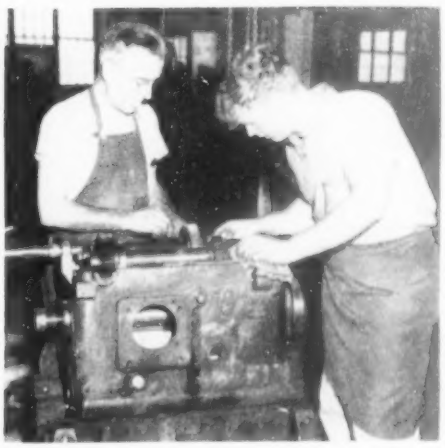
1 AFTER HEAVY "GRIME" WAS SCRAPED OFF, the steam jenny plus a detergent removed the more stubborn burned grease and tars.

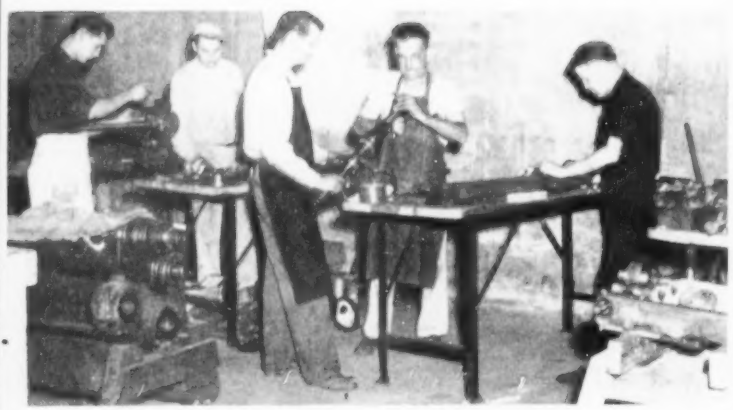
2 FOLLOWING SANDBLASTING AND PRIME PAINTING, machine parts were dismantled, tagged and cleaned internally.



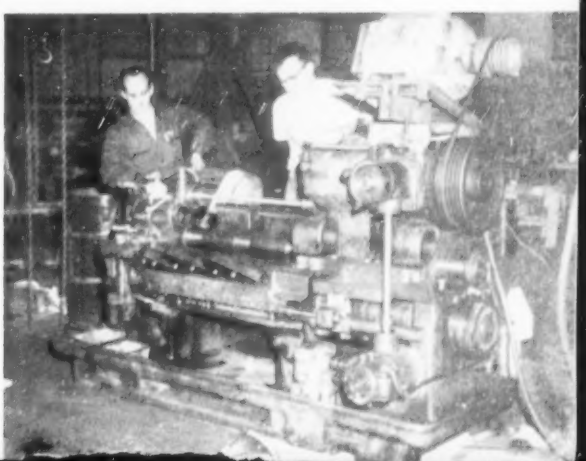
3 FINAL CLEANING of machine parts and tooling was done by vapor honing, followed by degreasing or a mineral spirits bath.

4 SKILLED MEN instructed green hands in the techniques for salvaging components. Some gears could be saved, but ball and roller bearings had to be replaced.





5 75% OF SPINDLES, shafts, clutches, pumps and slides could be reclaimed and restored to new machine tolerances.

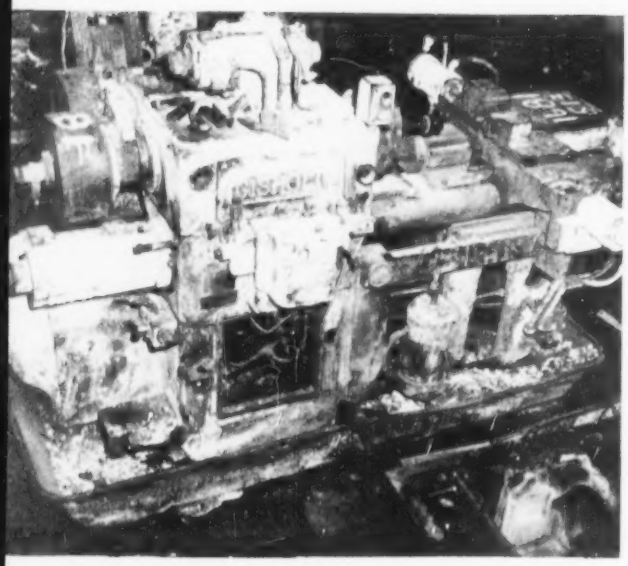


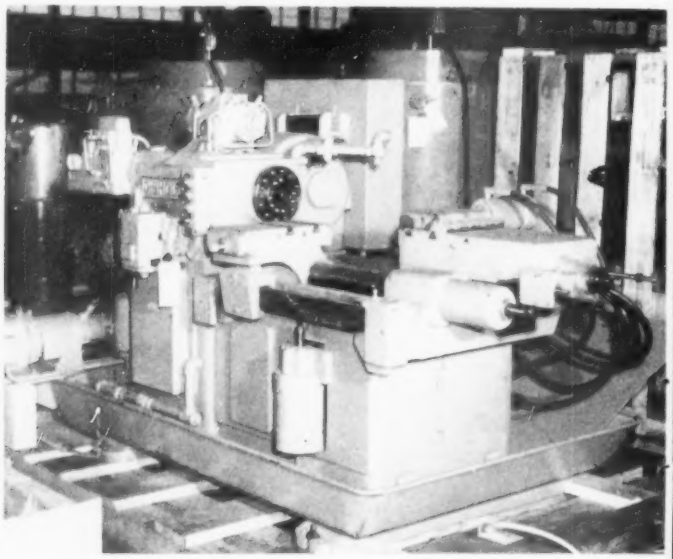
6 FINAL CHECK-OUT of machines was approved after Hydra-Matic transmission parts were turned out successfully to GM drawings and specifications.

EVERYBODY HELPED

Gisholt Machine Company had a similar problem in the return of more than 50 automatic lathes, representing a new value of $3¼ million. Machines were salvaged by a special staff of engineers and production men organized to work full time and overtime to do the job without interfering with regular production schedules. Their opinion: "If all industry and our suppliers hadn't caught the spirit of the thing, we never could have gotten the job done."

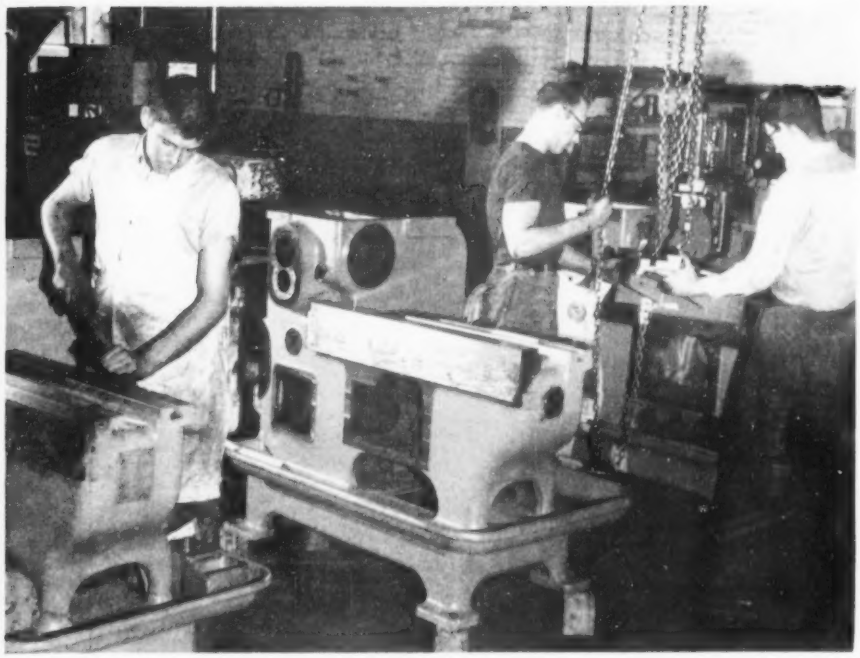
◀ **BETTER THAN 1 OUT OF EVERY 3** of the more than 50 Gisholt automatic lathes was a total loss. Here the group is lined up for detailed inspection





TWO WEEKS made this difference in a Gisholt, automatic. Fire damage is a much more extensive thing than one might consider, but cooperative effort on an emergency basis is also equally more productive

SET UP A SPECIALIST TEAM



SUNDSTRAND SET UP a separate assembly line for rebuilding burned machines. The whole program necessitated assigning one key man from each major department to oversee its particular department participation, including engineering, production, purchasing, and the hydraulic and electrical department

Sundstrand varied from the two preceding plans somewhat. Functions of its specialists in rebuilding 37 machines were:

Engineering and assembly — Supervise disassembly, reassembly, and preliminary and final inspection.

Purchasing — Ordered anticipated and finally needed air cylinders, motors, bearings, sub-contracted for gears, spline shafts, found special cutters and tooling. Quantities purchased were greater than required for Sundstrand use, for they also covered needs of other companies rebuilding Sundstrand machines.

Production, electrical, hydraulic —Actual rebuilding of parts and machines. Some entire assemblies, such as front or rear carriages, were sub-contracted, both for replacement of burned-out units and for new machines to replace scrapped ones.

Three engineers had full responsibility for checking-out rebuilt machine tools and tooling.

PAIR OFF "GREEN" AND SKILLED MEN

Ex-Cell-O received 193 machine tools, found 15 unsalvageable. Cleaning up and dismantling, including 14 way-type precision boring machines, was done in a 30,000-sq-ft area leased from the Ford Lincoln plant. 50 green hands, supervised and assisted by 50 Ex-Cell-O machine operators, stripped down the machines in two weeks. A rented steam jenny and a 54-ton hydraulic press were found very useful during this operation.

Remachining and rebuilding were done in the Detroit area in Ex-Cell-O's own plants with aid from Detroit job shops. To prevent accumulative buildup of tolerances on the rebuilt ma-

EX-CELL-O LEASED FORD SPACE in the former Lincoln plant for cleaning and dismantling machines to avoid serious interruption to normal production operations

chines, shop personnel held to new-machine tolerances. Key steps were:

1. Machine heights were held to within 0.001 in. of each other during machining and scraping.

2. CI hydraulic-control panels were rebored, lapped, and fitted with new oversize bushings and plungers.

3. Some hydraulic drive cylinders were replaced, while many others were honed and fitted with new oversize pistons.

4. Badly warped spindle bridges were replaced with new bridges.

5. A percentage of the precision boring spindles were scrap, while others were repairable, but in all cases new bearings were a must. Spindle-assembly inspection included many tests, such as concentricity, hardness, etc, and finally a rigid running-in test at top speed.

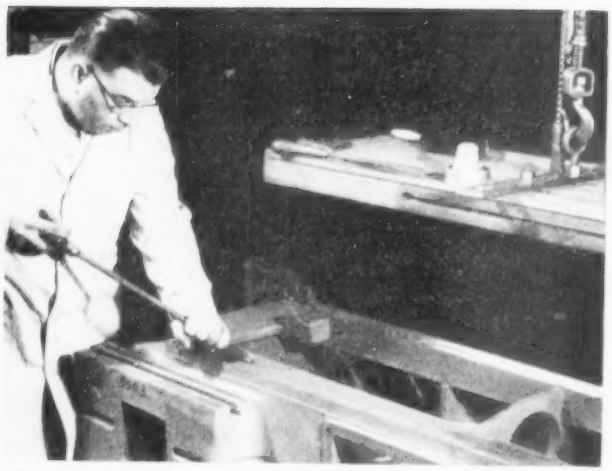
Note: Frozen spindle assemblies which incorporate preloaded ball bearings could be freed by 12-hr soaking in this solution: 4 parts penetrating oil, 3 parts kerosene, 1 part spindle oil.

6. Hydraulic braking on older machines was replaced with modern magnetic braking. Solenoid valve control also replaced hydraulic valving for toolstops, dwells, and machine cycling.

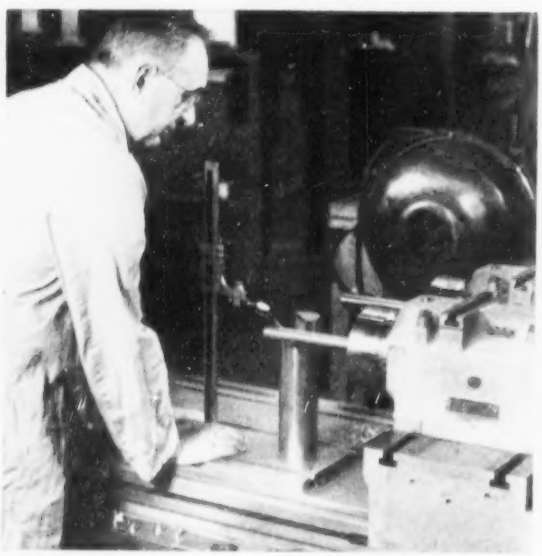
7. All hydraulic components were checked out under static and dynamic pressure on test stands simulating operation.

PS: Machine hands on this work learned as much in 6 weeks as they normally would in 3 years. Variety and pressure of the job forced all men to do all things.

REMACHINING AND FINAL ASSEMBLY were performed at Ex-Cell-O's main plant by careful planning, hiring extra help, and extending work hours. New-machine schedules would not be delayed. Here a scraper reworks a machine table to a gage in the background



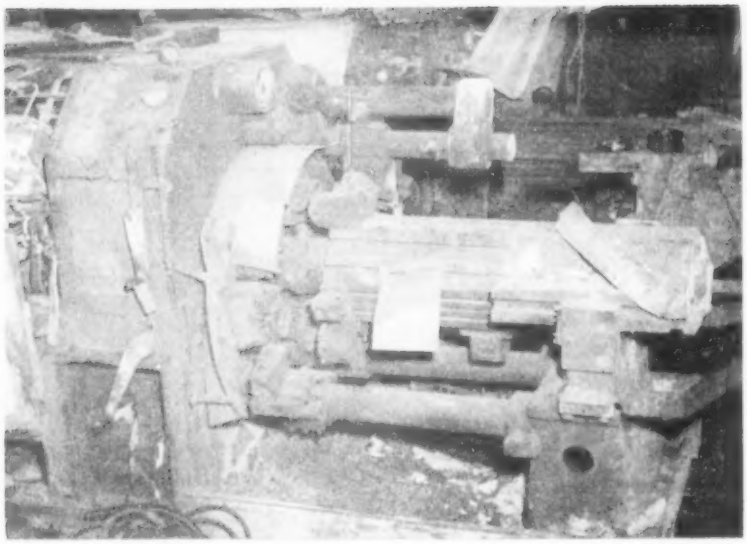
AFTER TABLES WERE SCRAPED to the master, bases were scraped to the tables



SPINDLE ALIGNMENT and height to the work table were checked to a master gage

MACHINE HEIGHTS of each rescraped machine were inspected to new-machine tolerances

REPAIR EASY ONES FIRST



New Britain-Gridley Machine Division classified machines upon receipt into three classes: good, doubtful, and scrap. Work was initiated on the first group, to get as many machines back in working order as quickly as possible. Then doubtful machines were tackled. Further and more detailed checks of the third group, based on experience with the other two, cut final scrap percentage materially. New Britain did the work in a separate area within the plant, using three outside subcontractors to assist.

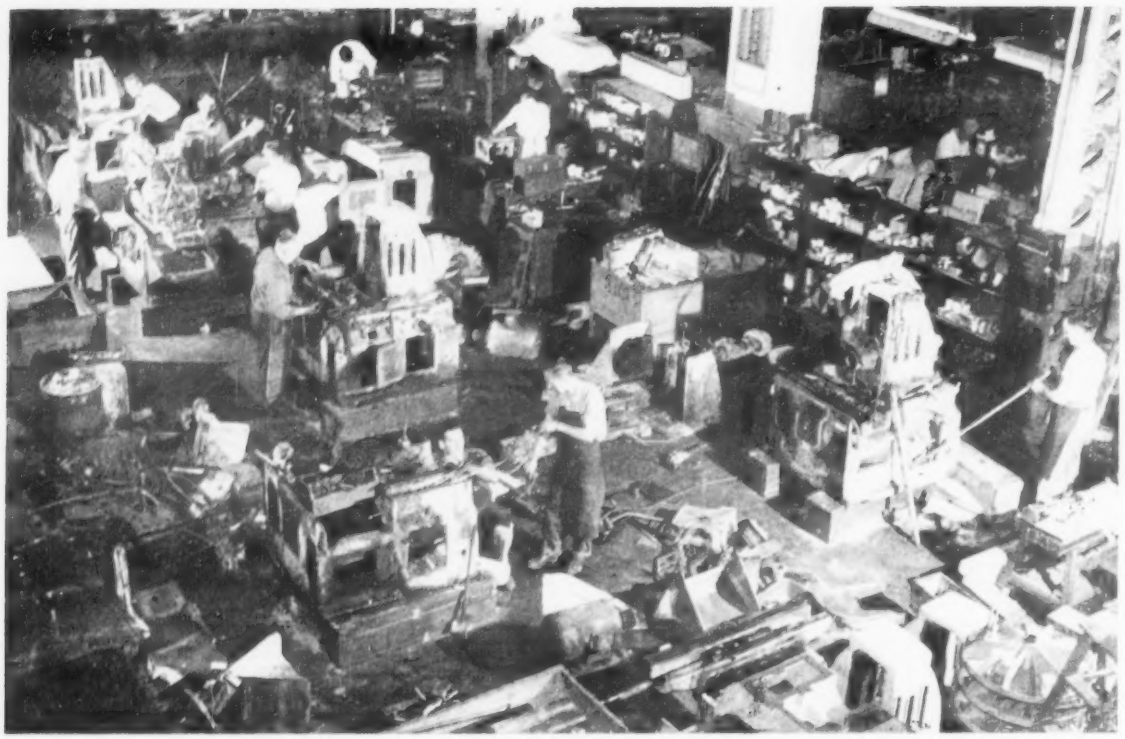
WHAT WAS LEFT of a New Britain-Gridley 6 spindle automatic chucking machine. After the machines were re-evaluated several times, many of those originally classified as hopeless were found salvageable

MILLING

CINCINNATI MILLING MACHINE set up special procedures to handle the entire program with greatest possible speed. Old-style machines that were obviously badly damaged and uneconomical to rebuild were junked. Those that were rebuildable were set aside for rebuilding. Of more than 150 machines returned to Cincinnati, over 90% have been rebuilt

SURVEY BEFORE SHIPMENT

Cincinnati Milling Machine Co. rushed a task force of executives and supervisors to Livonia four days after the fire. They surveyed well over 100 machines including grinders, which were shipped to the Cincinnati main plant. All work was done within the plant by procedures similar to those in lathe rebuilding. Critical elements were the spindles, some of which required replacement. (All spindles on grinders were replaced because of their critical loading.)



175 MEN, working three shifts a day, seven days a week, rebuilt 22 Kearney & Trecker milling machines in the rebuilding department of the manufacturing division. Because of the heat distortion, it was necessary to replace all non-ferrous metal parts

USE SHOP VOLUNTEERS

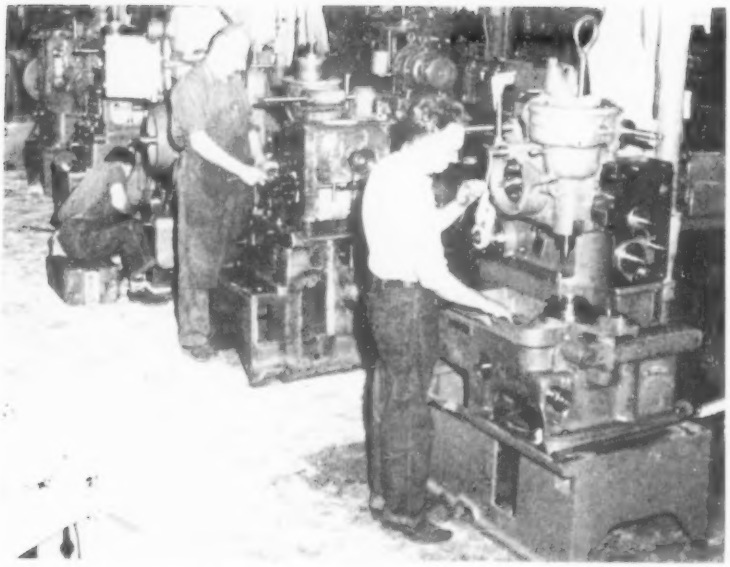
Kearney & Trecker received 22 millers, which were checked on arrival by a special staff set up from the service and rebuilding departments of Manufacturing. Men were added as work was outlined until 150 to 175 were employed in a 24-hr-a-day, 7-day-a-week program, many of them volunteering for extended shift hours or even shift changes so actual production lines could be set up. Only two machines required scrapping, but parts of others had to be replaced. K & T credits the speed and smoothness of the operation to the realization on the part of its employees that workmen like themselves at Livonia were out of work until machines could be returned.

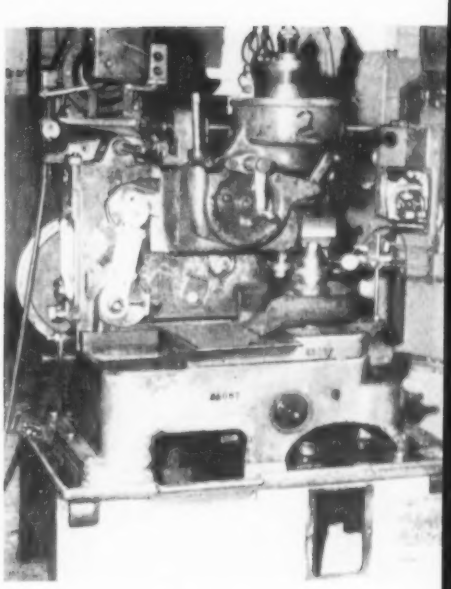
GEAR CUTTING

ADD A SHIFT, AND SUBCONTRACT

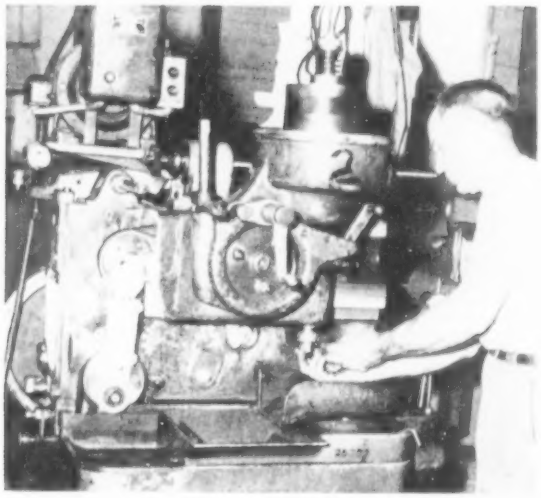
Fellows Gear Shaper had 31 machines to rebuild, including Red Line checkers, helical cutters, cutter sharpeners, and gear shapers; 13 were returned within 18 working days. The work was done by regular departments, with the addition of a night shift in Final Assembly, by adding 25 new men and increasing the work week 8 hr. Also, some 30% of machine parts, such as worms and wheels, cutters, and 10% of the tooling was subcontracted. Spare parts available were split 50-50 between Fellows own requirements and those of other companies also rebuilding Fellows machines. Cutter spindles and driveshafts, very critical in these machine tools, were all replaced. Where castings required replacement, Vermont Foundries, Inc, increased its work week to rush them.

Fellows received orders from GM, as a result of the fire, for over 100 new machines, mostly gear shapers, on which delivery was begun Oct 16 at 7 a week.





REHABILITATION of burned machines was absorbed into the regular assembly lines at Fellows Gear Shaper. Because of functional requirements, all cutter spindles were replaced. After final assembly, machines were run in to new machine specifications for periods from 4 to 8 hours.

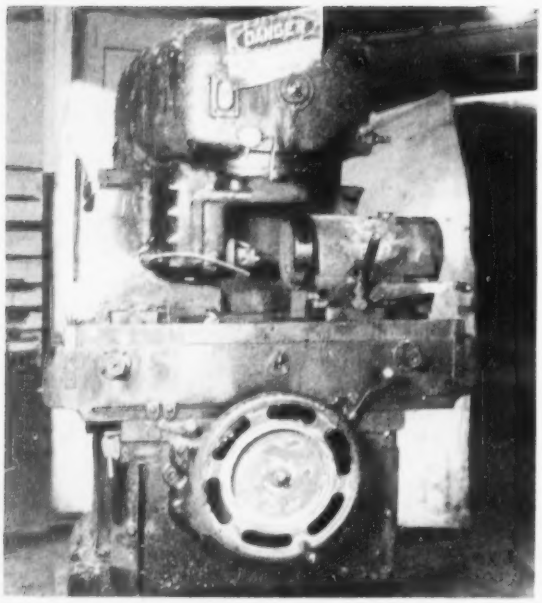


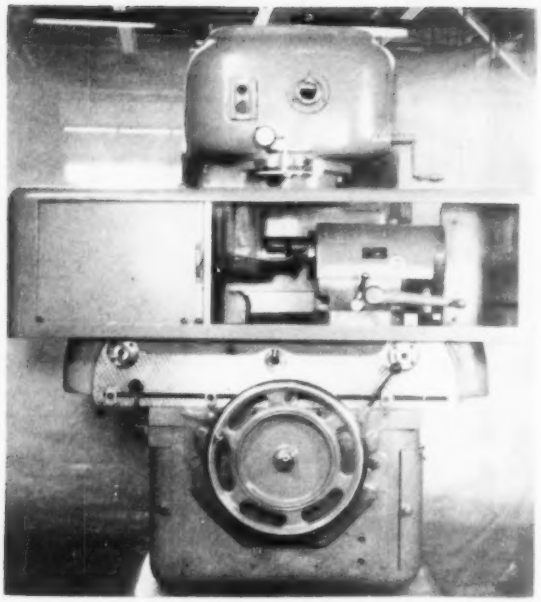
AS THE FINAL STEP before finish painting, Fellows, typical of the other builders, certified the machines by cutting gears for which they were tooled and inspecting them on a Red Line checker.

THIS MACHINE WASN'T SALVAGED

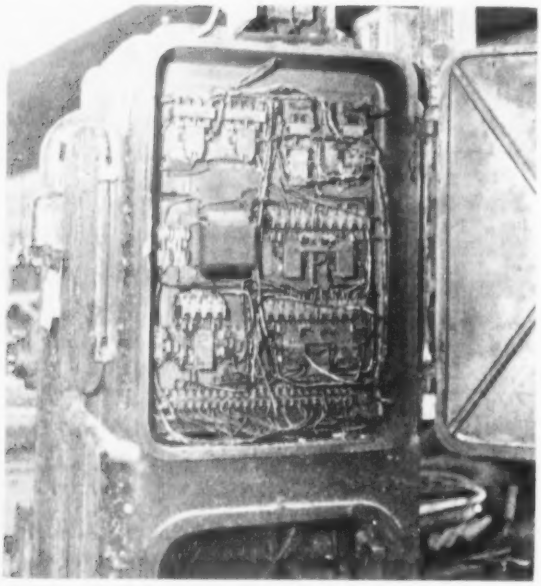
BRAZE BURNED C I

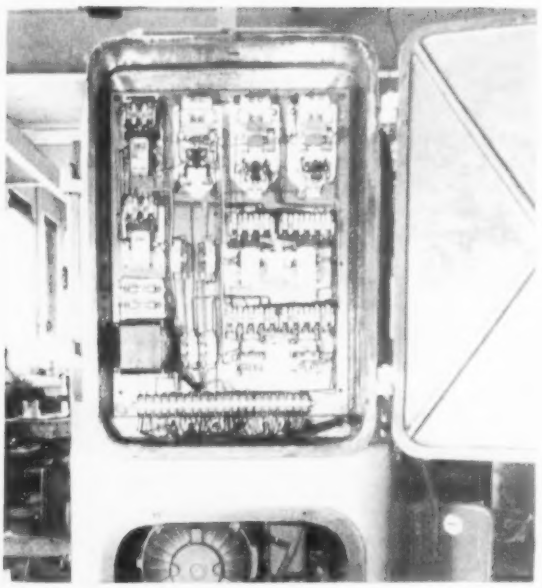
National Broach & Machine Co found cases in which even cast iron had melted. If this was in critical areas, the casting was replaced; otherwise it was repaired by conventional methods, including brazing, remachining, and scraping to new-machine tolerances. In several cases, where bronze bushings had been melted, reboring of the casting 0.030 in larger still showed bronze in the cast iron. More than 50 machines were rebuilt by procedures previously outlined.





THIS ONE WAS. It's an internal shaving machine returned to National Broach. The bronze bushings had brazed themselves to the cast-iron surfaces and even after they were bored 0.030 in. oversize, traces of bronze remained.



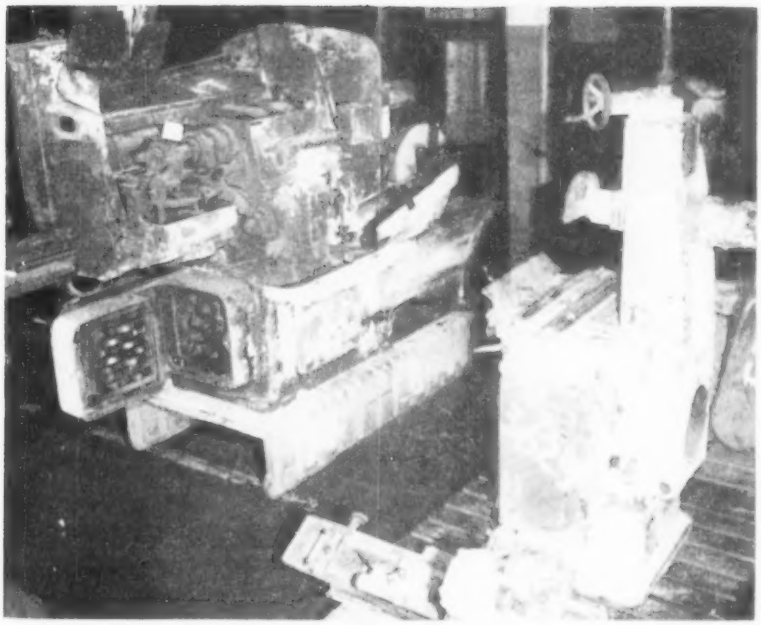


THROUGHOUT THE ENTIRE PROGRAM and without exception, all electric motors, control panels and wiring were automatically scrapped. To maintain the schedule for this program Michigan Tool sub-contracted machine parts, which were normally made in its own shops, to outside vendors. Quality control of these parts was assured by constant follow-up.

INCREASED WORKING TIME

Michigan Tool Co cleared 20,000 sq ft of storage space for a rebuilding area, increasing working time to two 10-hr, 6-day shifts per week, and added 15% employees. The bulk of the 79 Michigan machines found salvageable were rebuilt by Michigan, the rest by GM toolrooms under Michigan supervision.

Both National and Michigan found suppliers of electrical and hydraulic parts eager to help, and employees conscious of the need for extra effort in emergency.



BROWN & SHARPE removed parts of machines from their own production equipment, cannibalized parts from scrapped equipment, and new parts from their production assembly line to rebuild machines in this condition on receipt

CANNIBALIZE AND RESCHEDULE

Brown & Sharpe received 20 machines, 12 of them grinders, 7 automatics, and one miller. Engineering worked around the clock, cannibalizing their own equipment and taking units from production lines. Return of machines was completed in five weeks, 3 grinders and the millers going back in two weeks, 5 grinders and 2 automatics the third, 4 grinders and 2 automatics the fourth and 3 grinders the fifth.

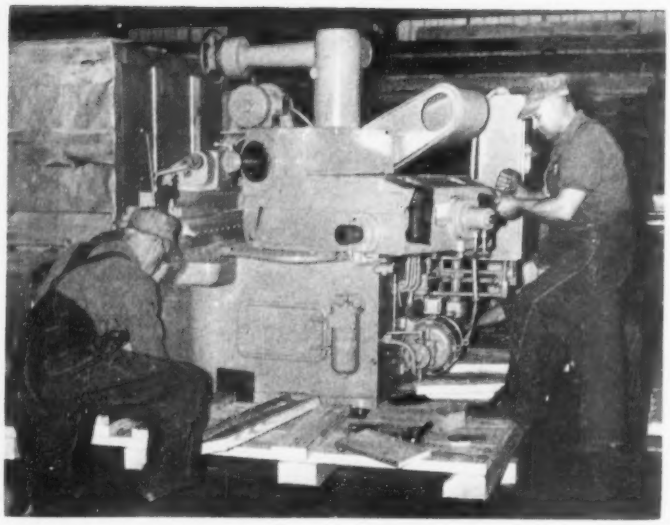
ASK FOR EXPERIENCE

LANDIS TOOL SELECTED ITS SHEET-METAL SHOP for the rebuilding program because it contained the only available crane facilities. As machines were disassembled, parts were routed to regular departments for restoration

Landis Tool sent telegrams to branch offices requesting experience with fire-damaged machine; brought replies that most could be rebuilt and gave details. Work week was immediately increased, men recruited from all departments for the job, and a small night force added.

Few parts were found to be scrap, outside grinding wheels, which were either severely cracked or broken. Spindles were cleaned thoroughly and some "kissed" lightly by regrinding. All were tested for accuracy and hardness to new-machine standards. Work centers were reworked. The first rebuilt machine went back Sept. 9, and others promptly thereafter.

WHEN PENETRATING OIL ALONE did not free machine part, combinations of heat, bars, lead hammers, hydraulic and screw jacks did the trick



"SPRUCED UP" and in 95 to 100% of new machine tolerances, this grinder is on its way home. Landis reannealed all salvaged machine castings when it was discovered that the hardness had dropped 20 points Brinell. Some castings were so near allowable tolerances that scraping alone brought them into line

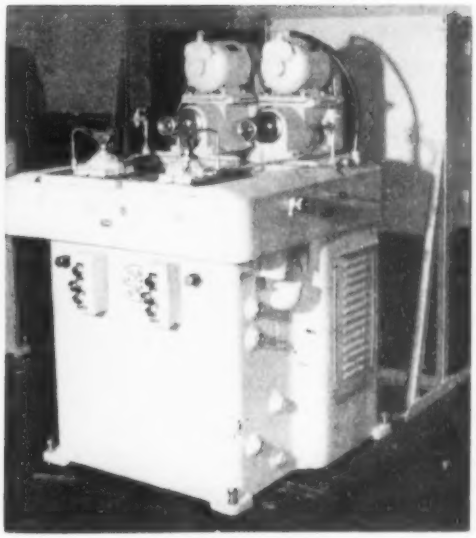
DIVERT PRE-DONE MACHINES

TO REALIGN THE WORK SPINDLES of internal grinders, Bryant touched up the nesting bores for the spindle housing with an eccentric rotary grinder mounted on the work slide. This is a general view of the rebuilding department

Five of the six Bryant internal grinders could be salvaged in the regular rebuilding shop. (Bryant Chucking Grinder Company is unusual among machine-tool builders in having its own rebuilding department in a separate plant.) The sixth machine had a crack in a vital area of the machine frame. The rebuilding shop, going on a 65-hour work week, cannibalized the six machines to rush out three rebuilt ones, then rebuilt the other two by supplying spare parts and new components. All grinding spindles were scrapped because of heat damage to close tolerances.

Several new machines which were ahead of schedule were diverted to Livonia as replacements for units destroyed in the fire with permission of the customers concerned. These will be replaced by top-priority production of new units without significant effect on delivery schedules.

HONING



MICROMATIC FACED EVIDENCE of fire damage like this (left). After respindling and replacing motors, controls, etc, to produce the equivalent of a new machine for GM (right), the company has instituted its own fire-prevention program consisting of education and training in use of fire-fighting equipment

RESCUE VITAL COMPONENTS

Of 12 Micromatic honing machines involved in the fire, only five were found salvageable by GM master mechanics. Micromatic, like Bryant, does its own rebuilding, so had only to divert additional men to the work. Stripping and inspection showed that 25% of parts of the five machines were scrap—in some cases, cutting torches had to be used to cut away sections to rescue more-vital components. Hydraulic and coolant pumps were returned to Vickers for repair or replacement, automatic rotary-indexing tools to Sundstrand. These companies, as did motor, electrical-control, hydraulic, and parts makers, returned or replaced the parts promptly despite their own heavy work loads from the same cause.

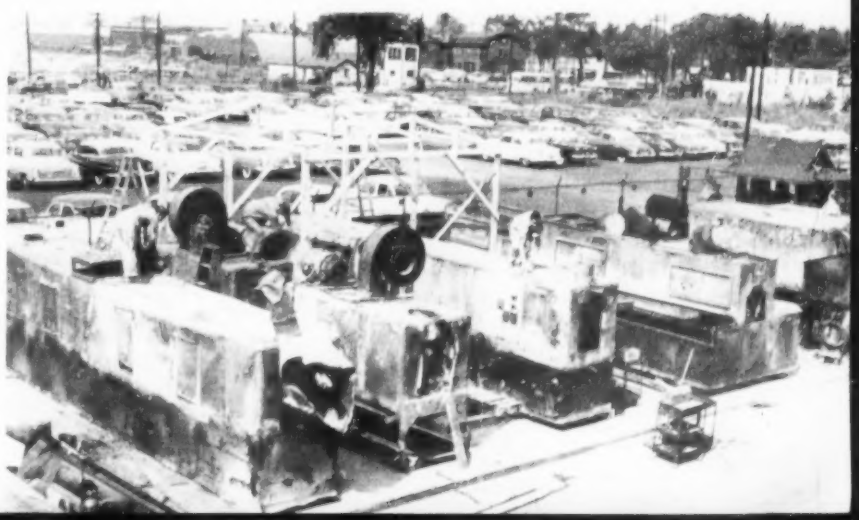
All hydraulic cylinders were replaced because of damage to close tolerances. New-type adjusting heads and upper bases replaced obsolete elements. Uniquely, Micromatic had up-to-date tooling records and drawings, kept up to date by reports of its own men.

To replace the seven scrapped machines, Micromatic got other customers to divert back-ordered machines on the promise of top-priority replacement.

CLEANING

Detrex Corporation offered to salvage all metal-cleaning equipment at Livonia, whether or not it was Detrex-made. GM gladly accepted. First returns were made in three weeks, and only one small machine was scrapped. Said a Detrex foreman: "They may not look pretty, but they'll work!"

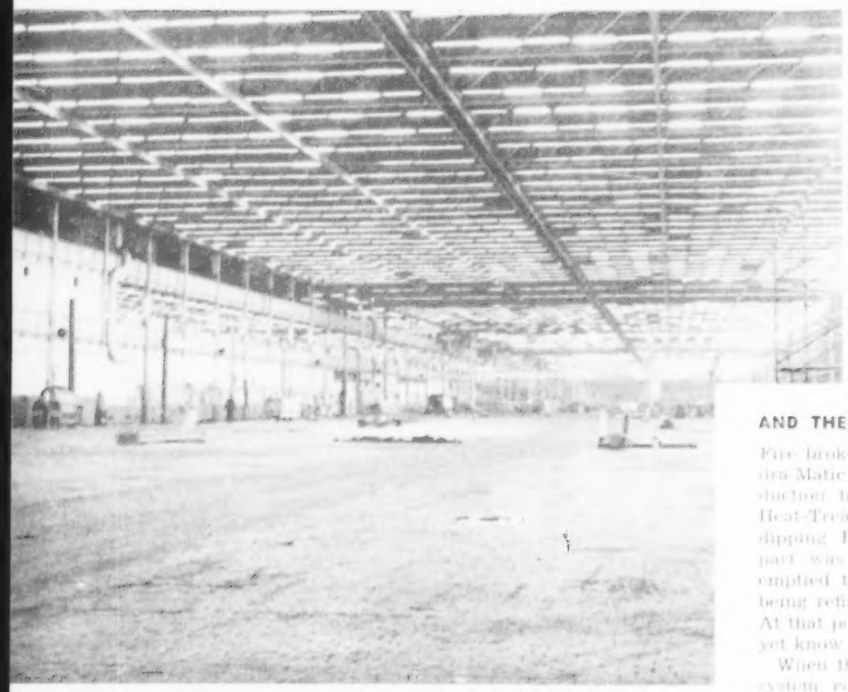
SALVAGE BY TYPE, NOT BRAND

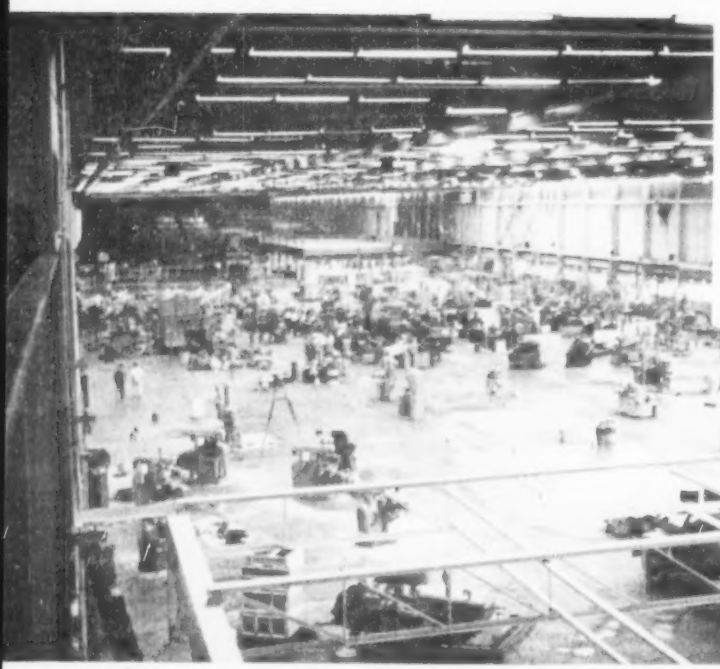


WORKING ON A 30-DAY DEADLINE to salvage or replace, Detrex constructed temporary shelters over the gutted machinery and went to work

MEANWHILE, GM BEGAN TO REBUILD

THIS IS PART OF THE 1 1/2-MILLION SQ FT of floor space GM has leased at Willow Run. Its entry utilities and conveyor lines, a steel-girt ceiling has been installed, and ventilating systems have been improved.





AS OF OCT 5, there were more than 1553 machines delivered to Willow Run.

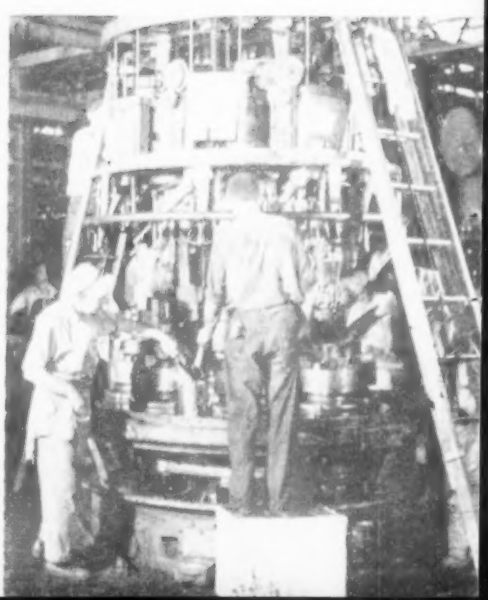
FORTY GM PLANT-LAYOUT MEN, including 20 layout chiefs from GM plants throughout the US, rushed a new plant arrangement. The layout 1/8 in./ft. shows exact location of the more than 3,000 machines.

AND THEN — FIRE AT WILLOW RUN

Fire broke out the night of Nov 8 in the new Hydra-Matic facilities at Willow Run, just after production began again. The fire originated in the Heat-Treating Dept this way: Two workers were dipping Hydra-Matic parts in quenching oil. A part was dropped in the vat, which had to be emptied to retrieve the part. While the vat was being refilled, the hose sprayed oil against a wall. At that point, the fire started. Plant officials do not yet know the source of the spark that started it.

When the oil fire set off the overhead sprinkler system, cold water was showered on a battery of cyanide pots. That caused a series of six explosions. Fumes and smoke from the molten cyanide solution filled the plant, and 1200 of the 1500 employees on the second shift were forced out. The fire was brought under control within 10 min by Kaiser Motor Corp's fire brigade and Willow Run Airport firemen.

General Motors spokesmen described the loss caused by the fire as "nominal." Production was halted for only two hours. Damaged furnaces will be repaired in a few days. In the meantime, heat-treating will be done by other plants in the Detroit area. The plant had 5000 hourly workers and 1200 salaried workers on Nov 8.



ONE WEEK FOLLOWING THE LIVONIA FIRE, Chevrolet's Tonawanda plant started to rebuild 52 Livonia machines. Plants at Bay City, Saginaw, and Toledo have been manufacturing parts for assembly of Hydra-Matic transmissions at the Ropelle plant.

don't let it happen to you

WELDING PERMITS will help keep a check on hazards, may prevent fires caused by welding or dangerous areas

Experience with the recent disastrous fire at the General Motors Livonia Plant has demonstrated beyond all question that there is no such thing as a fireproof factory. The structure may, indeed, be built of noncombustible materials, but what is frequently overlooked is the high flammability of the building's contents. It is like saying that an artillery shell will not explode because it is steel. It isn't the shell that causes the trouble—it's what's inside it.

Machine tools will not burn, but the oil in and over them is highly flammable. Electric wiring will not burn, but the insulation will. Exhaust systems will not burn, but the entrapped dust will, and they make excellent chimneys to draw the flames through the plant. Glass-fiber roofs will not burn, but the tar that seals the joints and covers the surface makes an excellent fuel—as GM discovered. And, in addition to these hazards, there is almost always paint on walls, ceilings, and machines, or liquid paint in open containers; oil on floors, or on machines and parts; solvents and thinners in drums or open containers; oily rags and refuse, whether in containers or tossed into dark corners; and, in many cases, chips of aluminum or magnesium scattered over the floors or machines. Once given a start—and sometimes a spark is enough—all these items can add their enormous potential energy to the fury of a fire.

If then, even a modern "fireproof" plant can be utterly destroyed by fire, what can management do to protect its property? Obviously, the first thing is to see that a fire does not start, by taking every possible precaution. And if, despite all precautions, a fire does start, means must be available for its immediate extinction. It has been said that every fire starts as a small blaze. This is true. Even the Livonia fire began as a small blaze from a cutting torch but, because extinguishing equipment was inadequate, it spread with unbelievable rapidity until the entire plant was engulfed in a matter of minutes.

Fire protection is not cheap, but it merits first call on every dollar available for plant investment; it may save its cost a thousand times over when the red fox starts to run along the roofline. What point is there in installing a million dollars' worth of new machines that can be destroyed overnight for lack of a few thousand dollars invested in fire prevention?

PLANNING FOR SAFETY

Fire prevention is not merely a matter of buying a lot of extinguishers, hoses, and pumps. It is primarily a personnel problem. Every employee, from the chairman of the board down to the unskilled laborer, must be made vividly and constantly aware of the danger of fire. This does not mean you have to scare everybody—you won't have any employees if you do—but it does mean that you must impress everyone with the fact that fires, like accidents, are always possible.

Housekeeping is unquestionably one of the first factors to be considered. This must be more than the occasional look-around on a Saturday afternoon when the men have cleaned up and gone home. It must be a rigid practice insisted upon every day and every hour. Admittedly, a plant cannot be as clean at 11 o'clock on Wednesday morning as it is at 3 o'clock on Saturday afternoon—but it can be as safe from fire. When metalworking operations are in process, there are bound to be chips and oil, sparks and greasy rags, but they do not need to be piled up or spread around indiscriminately. They can be swept up at regular intervals and disposed of in a safe manner.

Oil rags can be dropped into a steel drum, but it would be much better to have it fitted with a hinged cover held by a fusible link. Magnesium chips must be swept up promptly, placed in covered metal containers, and removed from the plant. Don't allow them to accumulate, even in containers; bury them at a safe distance from the plant. Aluminum chips also call for immediate collection and, although less hazardous, should be stored in limited quantities only. Sell them to a scrap dealer, even in lots of only a few hundred pounds. Have all flammable material in containers with safety covers. This includes excelsior and other packing materials. And do not permit more than the essential minimum to be inside the plant at any time. Store the remainder in a sep-

arate storage building well away from the others.

See that every employee is properly trained in the use of fire extinguishers. It's not enough to say, "Turn Bottom Up and Play on Fire." There are different types of extinguishers for different types of fires, and everyone must know which type to use and how to apply it to best effect. Keep extinguishers out in the open where they can be readily seen, and never permit anything to be stacked in such a manner that it makes them difficult to reach. Appoint a fire chief, even if there are only ten men in the plant, and make him responsible for periodic checks on all extinguishers. Above all, make sure that everyone knows exactly what to do and where to go if a fire does break out. Fire drills are the only way to be sure of this.

If you have a larger plant, say 200 employees or more, the above precautions still hold, but are by no means adequate. You need a properly trained fire department. It's going to cost you some money, but it's mighty cheap insurance. For extremely large plants, a full-time, uniformed, fire department, staffed by properly trained men and equipped with city-type apparatus, is sensible.

THE FIRE BRIGADE

Appoint a steady, reliable man, not necessarily of supervisory rank, as fire chief, and give him training at your own expense. Your local fire dep't or local civilian defense organization can usually provide the necessary training. Moreover, many states conduct Industrial Fire Safety Training Conferences, and information on these can be obtained from your State Safety Dep't. If you work on a two- or three-shift basis, have a deputy chief for the second and third shifts. In addition to personnel, provide one or two pieces of mobile fire-fighting equipment. In a large plant, one should be equipped with ladders, foam spray nozzles, and hoses with pump and booster tank for quick operation around the yard. The other can be a smaller unit designed and equipped to serve the interior of the plant. It should be equipped with large storage cylinders of carbon dioxide, dry powder, booster tank with hose and spray nozzles, battery-operated lights, gas masks, and other first-aid equipment. The National Board of Fire Underwriters will gladly furnish (free) copies of standards for such equipment.

Remember, however, that none of this equipment is of much use if it cannot be brought to the scene of the fire. So make sure your aisles are wide enough, and hold your foremen personally responsible for keeping them free from piled material that could hinder free passage. If there are any particular danger areas, pay particular attention to their accessibility.

Then, too, there's the matter of getting the equipment to the fire in time to control it. For this, you need a coded alarm system connected to plant protection headquarters where 24-hr supervision is provided. And you need at least one city fire alarm box in plant fire headquarters, and additional ones in the plant if size justifies it.

Never hesitate to call the municipal fire dep't. Far too many fires have gotten out of control because the plant fire dep't tried to handle them alone. And in this connection, it is wise to have the local fire chief look over the plant so he can get an idea of the location of hazards, means of access, protection available, and nature of materials causing the hazard. If a storage area is filled with lime or calcium carbide, for example, he wants to know about it in advance so his men won't apply water.

LOCATING THE HAZARDS

Although most of the common fire hazards are easily recognized, they are frequently overlooked because of the everyday familiarity. For this reason, it is advisable to have a proper survey made by a competent fire-protection engineer. Most insurance companies have such people on their staffs and are willing to make their services available. Such a survey should be made at least twice a year, but it is no use having it done unless you are determined to see that every recommendation is carefully followed.

Eternal vigilance is the price of fire prevention, and every hazard must be eliminated immediately. A perfectly obvious, yet usually overlooked, hazard is that of oil condensate. Hot oil in quench tanks, oil fog produced by grinding operations using oil coolants, and even the smoke from heavy turning and milling operations will eventually condense on walls and roof beams, leaving them coated with a steadily accumulating layer of combustible material. It is useless to contend that such surfaces are brick or steel and therefore will not burn. As shown at Livonia, such deposits can cause rapid spread of the fire, and the intense heat of their burning can so weaken structural members as to cause the roof to fall. Frequent cleaning, or installation of electrostatic filters, can eliminate this hazard.

A steel roof would appear to offer a maximum of protection, yet at General Motors the roof was the major reason for the rapid spread of the fire. Built up on a steel base, it consisted of alternate layers of glass wool, pitch, asphalt, and tar-saturated felt. It is estimated that over 2000 tons of such highly flammable material were employed. The heat from the burning interior melted the tar and caused it to flow through openings and drop in burning masses as much as 100 ft ahead of the main blaze. These started spot fires that eventually joined.

It is not suggested that all such roofs be replaced but, in new buildings, it might be well to consider a less-combustible construction. It is clear, however, that had the structure been properly and adequately sprinklered, the roof temperature could probably have been kept below the ignition point.

The now-famous drip-pan along which the fire first spread presents a difficult problem. Such a pan is obviously necessary under an overhead conveyor carrying wet parts, and most rust-inhibiting compounds are necessarily mixed with flammable sol-

vents. Quick draining and frequent cleaning would help here; a sprinkler system would most probably operate before a fire could become serious; but a carbon-dioxide system would be the ideal solution. One thing is quite clear: When hazards are above normal reach, means must be provided for immediate access, and any potentially dangerous operation must be isolated to contain the fire.

The official report issued by the fire underwriters states that as soon as the fire was noticed by the welding watcher, he reached for a nearby 20-lb carbon dioxide extinguisher; other employees brought carbon-dioxide and dry-powder extinguishers into operation, some from ladders. The fire was prevented from reaching the rustproofing tank, the carbon-dioxide system of which had already been set off by the heat. But the drip pan began to buckle and fire dropped to the floor. And by that time the extinguishers were empty. Then the oil condensate on the underside of the roof began to burn. This caused burning of rubber-covered power cables which was accompanied by electric arcing and opening of breakers and the loss of light and power. By this time the roof covering had melted and ran through the joints into the darkened and smoke-filled area. All this happened within ten minutes.

Evidently there was no lack of prompt action by employees. The trouble appears to have been with the type of building construction, the absence of curtain walls, and the lack of sprinkler protection. It was complicated by the absence of roof openings through which heat and smoke could escape.

SAFETY PRECAUTIONS

As no other circumstance would have done, the Livonia fire points up the absolute necessity for the strictest observance of safety regulations. Once such rules have been formulated, do not permit the slightest deviation, no matter what the circumstances or what extra precautions you may take.

WHAT FORD IS DOING

Forewarned by a serious, but little publicized, fire in its own Livonia plant, and further stimulated by the GM fire, Ford Motor Co has substantially revised its fire-control ideas during the past year. One important step has been to change from a self-insured basis to purchased insurance. Chief reason for this is that it carries with it three inspections a year by the insurance company. Company inspection, of course, continues, but it now has the benefit of outside help. A fire controller's office has also been set up to work closely with insurance company personnel, each checking and cross-checking with the other.

Sprinkler coverage is receiving close attention. Insurance companies, of course, would like to see 100% coverage, but cost would be extremely high. So Ford is making careful studies to see whether this is absolutely necessary. Fire curtains are also being considered. Lack of fire walls has been blamed for the rapid spread of the GM fire, but modern production plants working on a continuous conveyor system cannot tolerate too many obstructions. Fire curtains, suspended from the ceiling as far down as possible without interfering with material flow, will not stop a fire, but they can help to check it by containing the spread of heat and flame to a considerable extent.

Wooden floors are restricted to areas rated as non-hazardous. Bare concrete may not be as comfortable for the workers as wood blocks, but it doesn't become oil soaked and it's a lot safer.

Water supply is now a prime factor in selecting new plant sites, and Ford is now insisting that there be two independent water sources at every plant. At Livonia, two quarter-million-gallon tanks are being installed exclusively for fire protection, despite the fact that the city has recently installed a new main in place of the old one which was so small that during the 1952 summer heatwave, toilets sometimes couldn't be flushed.

New emphasis is being placed on volunteer fire-brigade programs. All supervisory personnel is required to take a two-hour course to learn to recognize the nature of a fire and how to use the proper extinguishing medium. Blow-up prints of the GM fire are posted on all bulletin boards to remind employees that "It could happen here."

Only one day's supply of paint and other flammable material is permitted in the plant—all other stock must be stored in a separate building well away from the plant. This applies equally to supplies belonging to outside contractors. Construction shanties are not permitted inside buildings—no matter what their stage of construction.

Because it is relatively easy to kill a fire when it first starts, the company is installing more extinguishers and placing them within easy reach of

CHECK LIST FOR FIRE SAFETY

Are there sufficient exits, and are they located so all employees can reach them in minimum time?
Is there adequate sprinkler protection for the plant?
Is there special protection for particularly hazardous areas?
Have you a control system to guard against improperly protected welding operations?
Are open tanks of flammable liquids properly protected?
Does this protection extend over drain boards, etc?
Is there proper ventilation so vapors from flammable liquids will not condense on structural members?
Do you have a plant fire brigade?
Do all employees know what to do in the event of a fire?
Do you have a fire-alarm system?
Do you have direct alarm connection with your municipal fire dep't?
How long is it since you checked your plant for fire hazards?
What did you do about those you found?
Does your method of storing and handling combustible materials agree with accepted safe practices?
Is your water supply adequate?
Do your fire safety rules have real teeth in them?
Is there a responsible person, reporting directly to top management, who can make firm decisions regarding safety practices and safety engineering?
Are your plant records protected by microfilming and storing in a safe place?
Have you thought what fire could do to your production? Would it affect other plants, of which yours is a division?

machine operators, all of whom are being thoroughly instructed in the use of the equipment. Major program, however, is still housekeeping, and Ford feels that if employees can be taught to keep floors clear of chips, oil, solvents, and other hazards, the chances of fire are substantially reduced.

Tests were made Oct. 26 on two structures especially erected by Ford at a total cost of $10,000, in an effort to determine the effect of heat on two types of standard industrial roof construction.

An immediate result was a decision to eliminate the vapor-seal method of construction from roofs of five plants Ford is building. J. A. MacAlarney, director of plant engineering, said that while Ford definitely would discard the vapor-seal method, it is not yet certain what roofing material will be substituted. He expressed a hope that manufacturers would produce a fireproof adhesive for roof construction.

Tests were run on two structures identical in every respect but roofing. Both roofs consisted of steel decking, covered with 1-in. insulation, topped with three plies of tarred felt overlapped to give five thicknesses at all points. Each ply was mopped with coal-tar pitch. Gravel was embedded in the top coating of pitch.

However, one roof also had a vaporproof seal between the deck and insulating material. The vapor seal consisted of two plies of roofing felt, mopped to the decking with asphalt pitch. Vapor seal was used in the roofs of both the GM transmission plant and in the Ford tank plant in Livonia, Mich., which was partially burned early last year.

Plant engineers quickly agreed that the fire in the structure which contained vaporproof seal was fed and spread by streams of flaming asphalt pitch falling from the roof. That conclusion was the basis for the recommendation that vapor seal be eliminated from plants Ford is now building or has scheduled for construction.

The plants: Stamping plant at Walton Hills, Ohio; Hummel Engine plant in Cleveland; assembly plants at San Jose, Calif.; Louisville, Ky.; and Mahwah, N.J.

Immediate purposes of the tests were to determine (1) the degree that vapor seal helps to support combustion and (2) the added value, if any, of providing less fire danger by welding sides of metal deck roofing at mid-span between roof purlins.

The test structures were located in a salvage area near the Rouge plant in Dearborn, Mich. The buildings were 20x40 ft and rated as "Class A" by insurance carriers. Intermediate welds were placed along seams of the steel decking in one-half of the surface of each test roof to determine whether such welds give additional strength. Part of the underside of the roof panel and one supporting steel column in each structure were painted with fire-retardant paint in order to measure its effectiveness.

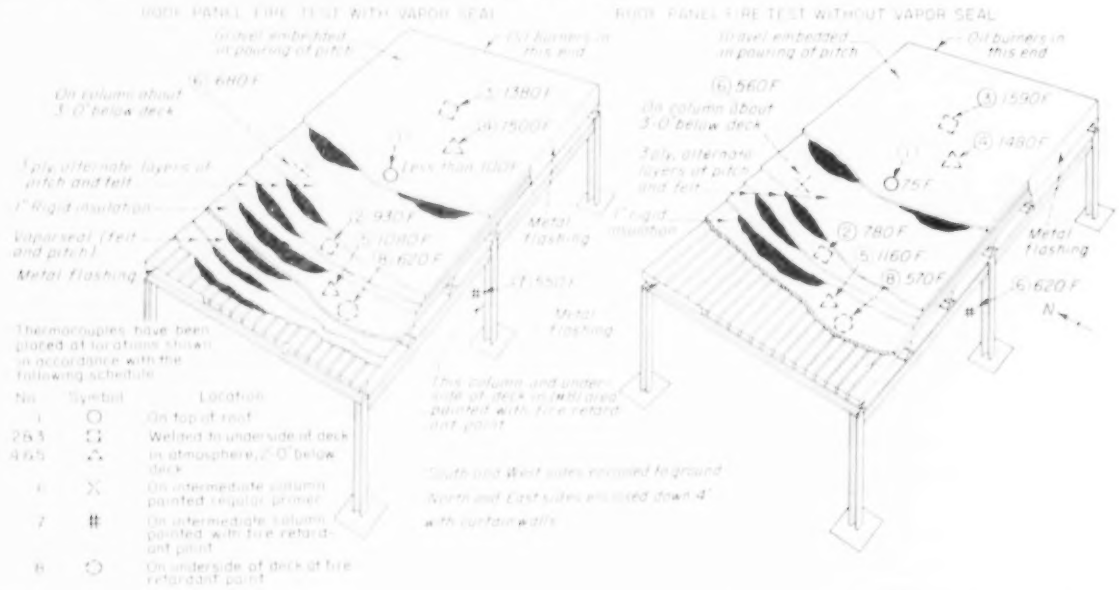
Temperature readings were charted by means of thermocouples attached to the underside of the deck, top of the roof and on various supporting columns. (See sketches below.)

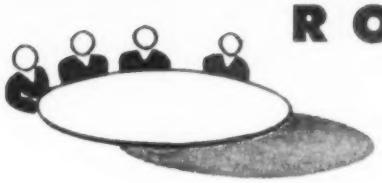
While temperatures on top of the roof remained under 100F, readings as high as 1599 F. were taken at points on the undersides of the roofs. Temperatures in areas painted with fire-retardant paint were substantially lower than those in other areas of the structures.

None of the steel columns, roof beams or purlins buckled as they did at GM's Livonia plant, but metal curtain walls collapsed and tore loose from the supporting columns.

Controlled heat was applied inside the structures by oil burners ejecting No. 2 fuel oil. The oil flames burned clean, so that smoke was of an external nature and engineers were able to locate its source.

TWO TYPES OF ROOF TESTED BY FORD—AND TEST RESULTS


ROOF PANEL FIRE TEST WITH VAPOR SEAL
Gravel embedded in pouring of pitch
Oil burners in this end
On column about 3'-0" below deck
3 ply alternate layers of pitch and felt
1" Rigid insulation
Vapor seal (felt and pitch)
Metal Flashing
Thermocouples have been placed at locations shown in accordance with the following schedule
No. Symbol Location
1 On top of roof
2&3 Welded to underside of deck
4&5 In atmosphere, 2'-0" below deck
6 On intermediate column painted regular primer
7 On intermediate column painted with fire retardant paint
8 On underside of deck at fire retardant paint
ROOF PANEL FIRE TEST WITHOUT VAPOR SEAL
Gravel embedded in pouring of pitch
Oil burners in this end
On column about 3'-0" below deck
3 ply alternate layers of pitch and felt
1" Rigid insulation
Metal Flashing
This column and underside of deck in this area painted with fire retardant paint
South and West sides enclosed to ground
North and East sides enclosed down 4' with curtain walls



ROUND TABLE

Shopkeeper

"I just traced down my new men, Ed. What's the idea of allowing Jones to sell them micrometers in the shop?"

"Well, I thought it would simplify things, Al. Parker and Perkins is the official supply house in town, but some of the boys can't get there when they're off duty. Actually, it doesn't cramp Jones too much because he's a repairman and his work isn't regular anyhow."

"I don't like it, Ed. Giving Jones what amounts to a franchise to make money off the rest of the men isn't good practice. Besides, they all waste too much time waiting for him to be free and to take care of red tape."

"Aw, nuts, Al. Your new men will waste time anyhow. You can't expect them to start in working immediately. Besides, what better solution can you offer?"

"How about giving them time off to see Parker and Perkins? The company bus goes in there at least three times a day. They could take the trip and get everything at one clip."

"I don't think they could, most of them. Tools cost money, and most of the guys starting out haven't much to go on until they get a couple of paychecks under their belts. I imagine they'd have to take time off quite a few times before they were all set. In fact, that's what usually happens—at least until I let Jones take over."

"Well, isn't it illegal for an employee to handle that sort of thing in the plant on company time?"

"Evidently not, Al. I asked Harrison about it, and he said I could try it for a while. If it works out, he may let other men sell things, too."

"It just doesn't seem right to me, Ed. I'd rather the company had the toolcrib men sell tools to new employees, if they need them. At least you wouldn't have one man making a profit on all the others."

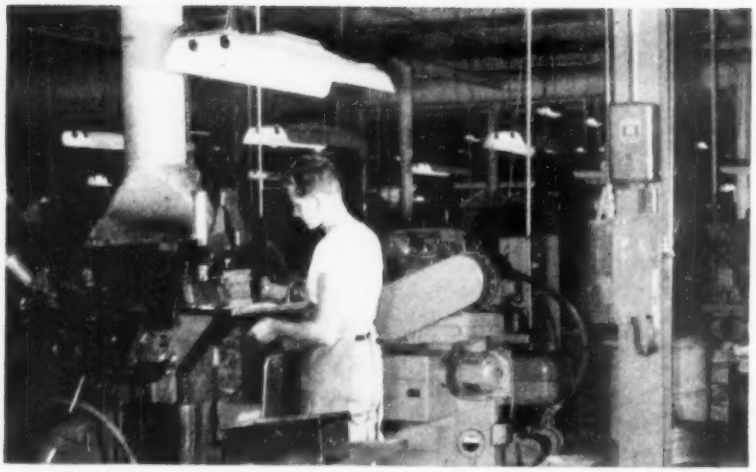
"Look, Al. Jones only makes a few cents on each tool—he sells them at cut rate, and I'll see that he continues to do so. As for the toolcrib idea; I don't want my toolcrib men wasting valuable time that they should be spending on keeping gages and tools in proper shape. That's an important job."

"Sure, Ed. You're right, but I think the men may object to Jones; and I know it's not a very efficient system."

"Then you'd better invent a better one, Al, because that's all we have now."

CAN A SHOP ALLOW *a single employee to sell tools to employees, or does this amount to a sort of monopoly? Is there a best way to handle tool sales to the working force, or does it only depend upon the particular shop in question. Your opinions on this subject may help others with such a problem. Discussions of earlier topics appear on later pages.*

STEAM VALVE (left) and blower switch (right) are placed on column close to machine. Guard around steam pipe prevents accidental burns. If fire starts, operator merely opens valve and presses blower "stop" button.



ABOVE CENTERLESS GRINDER, exhaust duct leads to central blower. Steam, at 100 psi pressure, is piped to T shape jets in all ducts and risers. While it will rapidly extinguish a fire, steam does no harm to work in process nor will it damage machinery. Note that operator leaves danger area to reach steam valve on column behind him.

STEAM, AND SENSE, CONTROL

Grinding, buffing, and polishing machines can create a serious fire hazard. When exhaust ducts are interconnected to a central blower system, a fire in any single machine will, almost instantaneously, follow the ducts like a powder train to spread the fire to other areas. Recognizing this danger, the Hartford Machine Screw Company installed a simple and effective fire extinguishing system which utilizes plant steam.

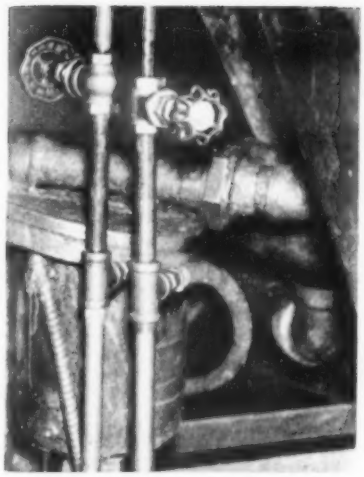
BY WM. M. STOCKER, JR., ASSOCIATE EDITOR

In Wilson, Connecticut, a suburb of Hartford, the Hartford Machine Screw Company operates a modern and very attractive plant covering 290,000 sq ft, all under one roof. Products are numerous and the operations performed utilize a dozen different styles of screw machines, plus heat treating, plating, anodizing, boring, broaching, milling, precision threading, roll threading, high-speed drilling, tapping, grinding, buffing, tumbling, and slotting machines.

When the plant was built, the company realized that, while these facilities offered tremendous productivity, any single machine could be the source of a fire which might halt all production. There were hazards, too, in maintenance and accessory equipment. Tremendous production advantage is gained from a plant layout that uses a minimum of separating partitions and internal walls, but this also increases the problem of fire control, if a fire starts. The most fire-prone machines in the shop are those for grinding, polishing and buffing. Not only because fires start more readily in these machines than in others, but because all of them are interconnected by centralized blower exhaust-duct systems, special precautions are always necessary.

With this problem recognized, the management decided to take immediate steps for fire prevention and control. A company-wide program was set up.

T-SHAPE JET is placed in riser duct, attached to lead-in pipe shown. Jets are 10 ft apart in main duct, hence steam never need travel more than 5 ft. In riser, steam sprays up and down



"KEEP COOLANT COOL", and you minimize a major hazard. Water constantly flows through 60 ft copper coil in each oil reservoir. Feed rate is varied to suit oil temperature by using valves shown

MACHINE-TOOL FIRES

First, soda-acid, foam, and carbon dioxide fire extinguishers were alternately spaced at convenient locations on roof-supporting columns throughout the shop. Reels containing 50-ft lengths of 1½-in.-dia fire hose also were placed, so that a person never need go more than 50 ft to obtain the proper extinguisher or a hose. Next, a code was established and the columns were painted with wide yellow bands to denote the kind of equipment they contained.

1 band — soda-acid
2 bands — foam
3 bands — CO_2
1 solid wide band — 50 ft hose

Simultaneous with installation of the fire-extinguishing equipment, a fire-prevention training program was made mandatory for all employees and was included in the orientation of new employees. While fire *prevention* is stressed, instruction is also given in fire *control*: techniques in selecting and using extinguishers, and the essential rules for handling flammable materials.

But even these steps were not entirely adequate. The grinder exhaust ducts were still a hazard and they could not be reached with ordinary extinguishers.

Steam Available

Steam at 100-psi pressure was available throughout the plant for processing and heating. Why not use it to extinguish fires? Wherever exhaust ducts existed, ¾-in.-dia steam pipes were installed parallel and adjacent to them. Then, at 10 ft intervals, take-off lines enter the ducts and are fitted with T-shape jets, so that steam never has to travel more than 5-ft before it meets steam from the next jet. Jets are installed on opposite sides of the central collectors to increase the extinguishing efficiency. A T-jet is also placed in the riser-duct over each machine. Steam valves and blower switches are grouped close together and are within easy reach from each machine. As take-off lines are short, very little condensate can collect to interfere with live steam entering the duct. While high-pressure steam is usually needed for the degreasers, this is not an added expense, there is now a firm rule that as long as anyone is working on grinders, etc, a fireman is kept in the boiler room and pressure is up in the boilers.

If a fire starts, the operator simply opens the nearest steam valve and shuts off the blower. The fire is extinguished in seconds.

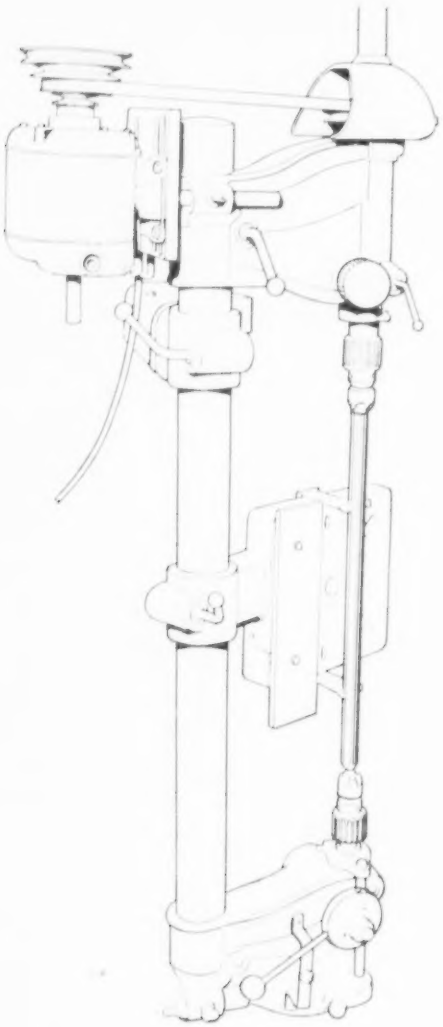
Periodic Cleaning Vital

Periodic cleaning is extremely important to the prevention of duct fires. Oil, grease, and waste accumulate upon the duct walls, will ignite readily from a spark or a small incandescent chip. Exhaust ducts for buffing and polishing equipment are the most dangerous; should be cleaned at least once every six weeks. Ducts for the wet grinders need not be cleaned as often. Nevertheless, they should be regularly inspected. Central collectors are cleaned every two months. By reducing the quantity of combustible material, minimizing the stuff that *can* burn, cleanliness does a lot toward fire prevention and simplified fire control.

Fire prevention is still based on avoiding the proper combination of fuel, air, and heat. Thus, to keep oil coolant temperature down during heavy cuts, to reduce oil fumes and fire hazard, a 60-ft length of ½-in-dia copper tubing was coiled and placed in each coolant reservoir. The coil was connected to inlet and outlet water lines and an orifice was provided at the inlet valve to permit a ⅛-in. dia stream of water to circulate. As the water never leaves the enclosed system it is not contaminated; is later used in plating and other processes.

This installation was so effective for heavy cuts that the coils were placed in all of the coolant reservoirs. An added advantage is improved work finish and lower coolant loss.

Practical Ideas

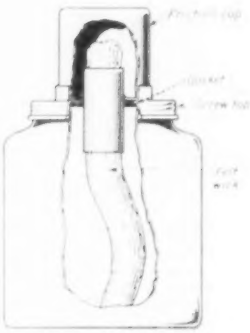


Deburr and Square Off Both Ends With One Operation

Deburring the ID and OD of aluminum tubes, as well as squaring off the ends and bringing the tubes to a set length—and doing both ends of the tube at one time—almost tripled production. This setup employs two drill press heads, each driving a commercially available deburring tool.

The operator holds the tube against a pair of V-blocks and brings down the upper spindle. Because the two tools rotate in opposite directions, we found that no vise was necessary; tubes are easily held by hand.

The tubes center themselves automatically, and an equal amount of stock is removed from each end of the tube. Instead of about 200 finished pieces per hr, we now produce almost 600 pieces per hr. The drillpress is instantly available for run-of-the-mill work between runs of tubes. *David I. Walt, New York, NY.*



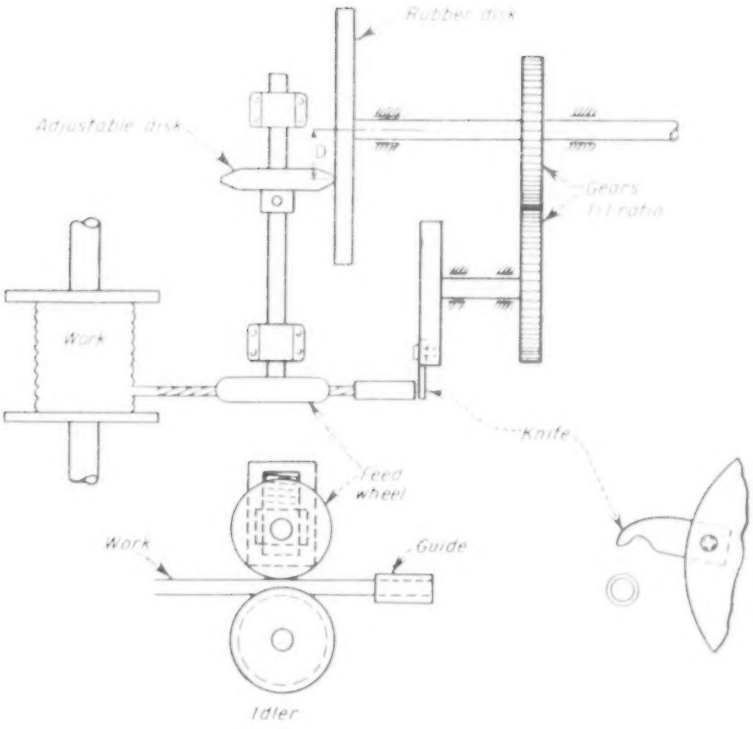
Bottle Dispenses Layout Dye

This bottle will simplify application of layout dye, by providing a ready source of the dye, in an easy-to-use form. There are a few points to be careful of in making the bottle. First, the wick should not be too tight, or pressure will build up inside the bottle, forcing dye out through the wick. Also, if wick is too loose, too much dye will come through the wick, when applied to the work. *Peter L. Bernardi, Detroit, Mich.*

One-Piece Drift and Hammer Leaves One Hand Free

When removing a drill from a drillpress, it is usual to pick up two tools—drift and hammer—occupying two hands, and requiring storage for two tools. This drift has a floating hammer-head permanently attached to the drift.

The drift is long enough that many drills can be levered out of their taper, but, should the drill be especially tight, a sharp tap with the hammer-head will easily dislodge the drill. *V. Palmer, Paddington, Australia.*



Variable-Length Wire Cutter

Different lengths of flexible electrical wire can be cut with this wire cutter. A friction drive to vary the speed of the wire-feeding wheel in relation to the cutting wheel changes the length of wires which will be cut. Cutting takes place between the guide and the knife on the cutting wheel.

Speed and rotation of wire-feed wheel are regulated by changing the point at which the rubber-driven wheel touches the driving disk. For example, if the rubber-driven wheel is 2-in. dia, and the wire-feed wheel is also 2-in. dia, the cutting wheel is turning at the same rpm as the rubber disk, and the length of wire which will be cut is $L = \frac{D}{d} ds$, or $L = Ds$, where D is the diameter of the rubber disk at which the rubber-driven wheel is set. With a rubber disk, 6-in. in dia, wire lengths up to 18½ in. can be cut.

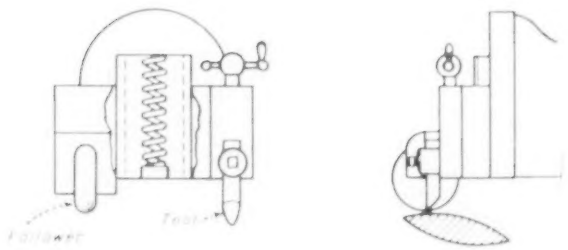
A spring maintains the proper tension between the wire-feed wheel and the fixed idler wheel. *George F. Kuskey, Deerfield, Ill*

Split Thread Dies Cut Machining Time

Running long threads with a stock and die in a lathe is frequently a problem because of the time involved in running the die off after the thread is completed.

We increased production 50% by cutting the die in half (with an abrasive wheel) through the clearance sections of the die.

After the thread has been run the required length, the two halves of the die are slipped out of the stock and removed. This eliminates running the die off. *Frank Beechele, New York, N Y*



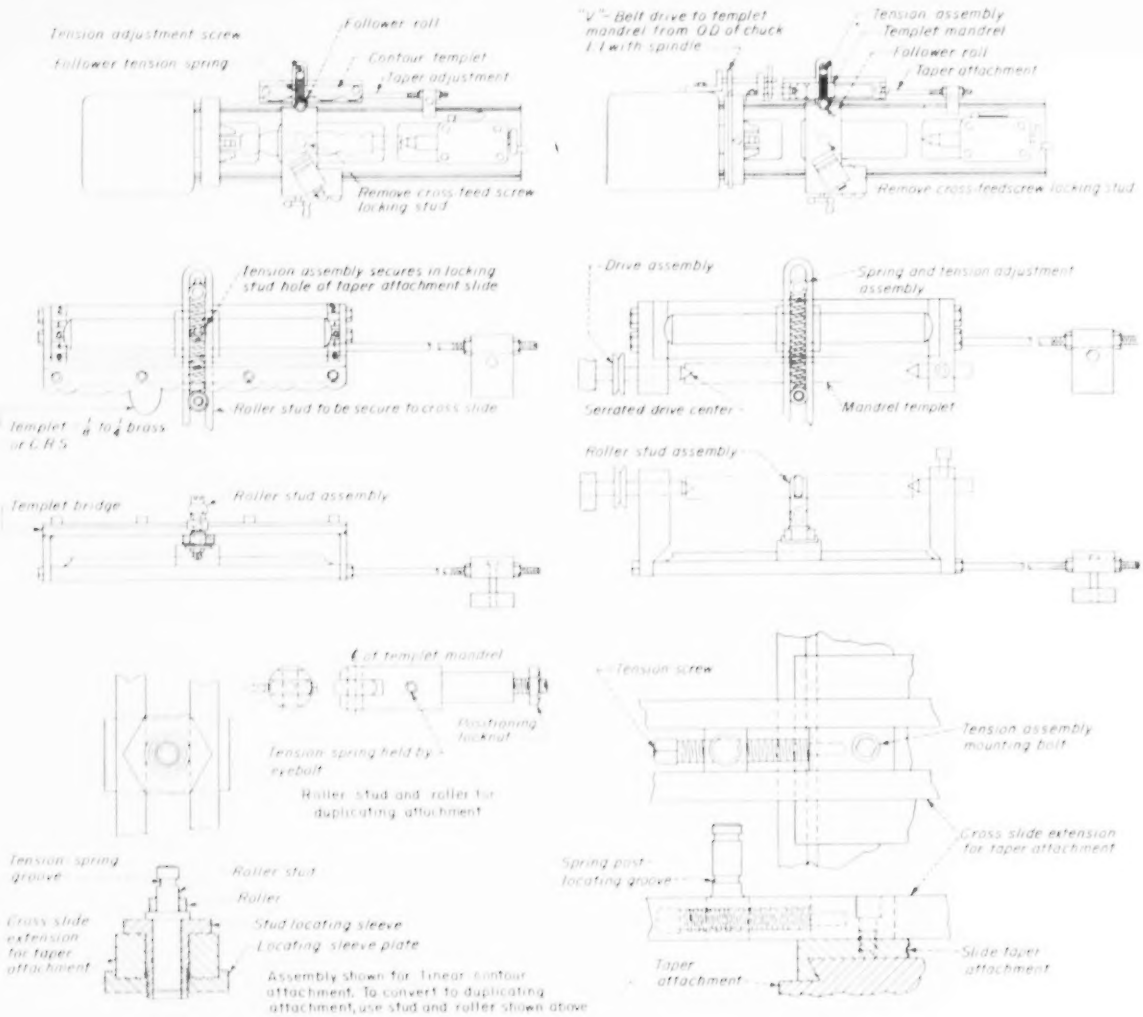
Spring-Loaded Head Turns Planer into Profiler

Machining of turbine and impeller blades to a given form and within definite limits presented a problem, but was easily overcome by making a special spring-loaded work head to fit a planer.

This work-head carried the tool tube and a form-follower wheel. A master form was placed on the worktable alongside the component to be machined. Pressure of the spring keeps the follower in contact with the master, and allows the head to rise or fall on dovetailed slides.

It is essential to keep the tool and wheel follower on the same center. Height adjustment is made with the tool slide which also regulates the depth of cut.

This arrangement can also be used to check a previously machined surface, by mounting a dial indicator in place of the tool. *R G Vue, Christchurch, England*


Tension adjustment screw
Follower tension spring
Follower roll
Contour templet
Taper adjustment
Remove cross feed screw locking stud
"V"-Belt drive to templet mandrel from OD of chuck I.I with spindle
Tension assembly
Templet mandrel
Follower roll
Taper attachment
Remove cross feedscrew locking stud
Tension assembly secures in locking stud hole of taper attachment slide
Roller stud to be secure to cross slide
Templet 1/8 to 1/4 brass or C.R.S.
Drive assembly
Spring and tension adjustment assembly
Serrated drive center
Mandrel templet
Templet bridge
Roller stud assembly
Roller stud assembly
Cut templet mandrel
Tension spring held by eyebolt
Roller stud and roller for duplicating attachment
Tension screw
Tension assembly mounting bolt
Cross slide extension for taper attachment
Spring post locating groove
Slide taper attachment
Taper attachment
Tension spring groove
Roller stud
Roller
Stud locating sleeve
Locating sleeve plate
Cross slide extension for taper attachment
Assembly shown for linear contour attachment. To convert to duplicating attachment, use stud and roller shown above

More Contouring Methods For the Small Shop

Often the small shop will have skillful mechanics, but not enough money to buy expensive (relatively) contouring equipment. The illustrated methods provide a way around the shortage of money. Both concentric and eccentric shapes can be turned with a moderate degree of accuracy.

With either the concentric or eccentric methods, rigidity is important, and at no time can the roll-follower be required to move at right angles to the axis of the lathe. Spring tension will determine the accuracy of contouring, hence it is advisable to have several springs on hand for various purposes and materials.

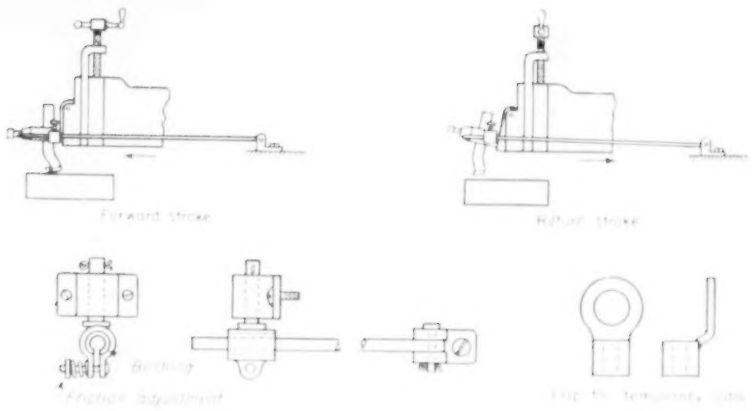
With the eccentric follower, it is necessary to have a serrated drive-center on the templet, to insure positive interlocking of the work and the templet. Radius of the follower should equal radius on the tool nose, to insure proper contour. *C H Winterburn, Jackson, Mich*

Formula Measures Thread-Groove Width

The formula to measure thread-groove width (*AM*—Oct 26, '53, p14ȿ) involves two trigonometric functions. A formula which requires only one function, which makes it easier to use, with less chance for error, is:

$$D = W \cos\left(\frac{90° - a}{2}\right)$$

Carl A Johnson, Euclid, Ohio



Attachment to Shaper Lifts Tool on Return Stroke

To get good service and tool life from a shaper tool, it is important that the tool doesn't drag on the work on the return stroke. It is also desirable, when a good finish is required on the work, that the tool be lifted on the last pass, in order to keep the tool from dragging across the work. Some big shapers have built-in tool-lifting devices, but the small shaper, commonly found in tool rooms, does not have this lifter. Many times the operator will have to sit by the machine, and manually lift the clapper on each return stroke of the ram.

Shown here is an effective and inexpensive attachment, easily built to fit any shaper, which will automatically lift the tool on the return stroke, and lower it on the forward stroke of the ram.

A steel rod is finished on one end to pivot on a pin in a bracket. This bracket is bolted on top of the shaper body, on one side of the prismatic guide, or any other convenient place. A simple pivot bearing is secured to the clapper. A stud enters this pivot bearing. Attached to this stud is a slide, slit on one side, which, in its circular bore holds a split bushing made from some friction-producing material, such as fiber. When the rod is slipped into the slider, a screw, operating through a spring, can be adjusted to control the friction between the rod and the slider.

When the parts are assembled, pressure on the slider is increased until the friction just holds the tool when raised by hand.

In operation, when the ram returns, friction of the slider will cause the clapper to pivot and thus lift the tool off the work. A stop, not shown, should be added to limit the amount of lift. On the forward stroke friction acts in the other direction, lowering the tool.

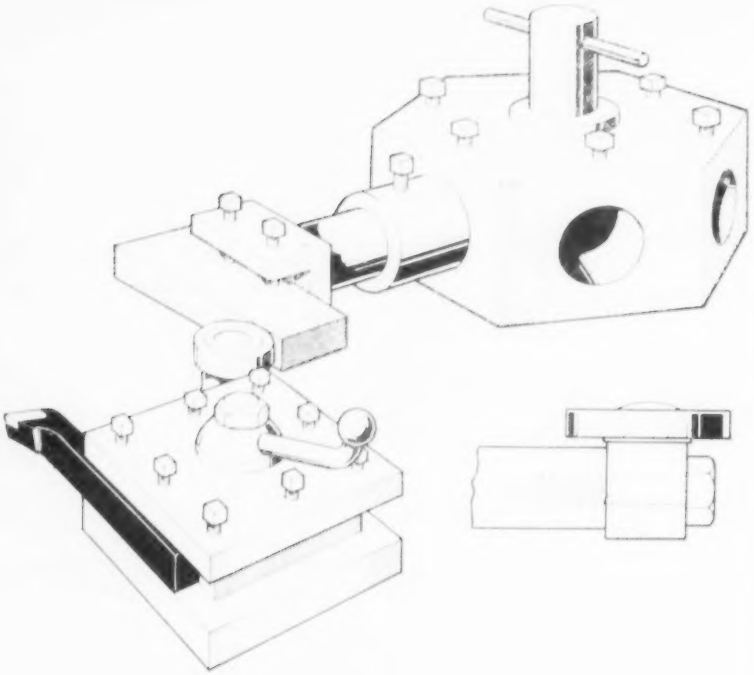
When not needed, the rod can be slipped out of the slide and placed alongside the ram.

For less permanent application, the pivot bearing can be made so that, instead of being bolted to the clapper, it is fastened under the tool bolt, replacing the regular washer normally under the tool. *Haim Murro, Bayonne, N J*

"Shock Absorbers" Cut Drill Breakage

We have a number of people doing construction work on sheet metal and angle-iron assemblies. This work involves drilling a great many screw-holes with electric gun drills. We were having a high drill breakage on this work. Upon investigation, we found that the operators were really leaning on the drills. The drills, breaking through, would thread themselves into the work on the drill helix. Then the two burrs in the hole would act as a nut and strike the top of the drill flutes. This sudden shock was causing the drill breakage. Rather than decrease production by telling the men to use less pressure and more care when breaking through, we made shock absorbers. These consisted of two steel collars drilled to slip over the drill. The collars were grooved on one face, to fit a spring, and one collar was tapped for a setscrew. The spring was secured to the collars with soft solder. This device eased the shock and considerably reduced the drill breakage. *Clifford Molloy, New York, NY*

When fitting tight keys, and there isn't enough time to make a gib key, cut the key ½-in. too long, and saw a recess about ¼-in. from the outside end of the key. The recess provides a gripping surface for removal. *D W Youngberg, Bellevue, Canada*

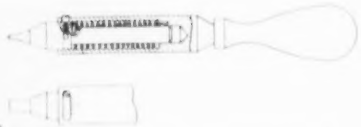


Templet in Knee-Toolholder Guides Taper-Cutting Tool

We were required to turn and bore some steel forgings, and then to face the forgings at a 10° angle. We had no special equipment for taper-turning, so we improvised.

First, a templet was machined to the desired angle, and mounted in a standard knee-toolholder in the hexagon turret. Then a piece of ¾ x 1 in. mild steel, to fit the square turret, was altered, as shown, to take a round stud which fitted inside a 2-in. ball bearing, press-fit.

When the ball bearing was touching the near edge of the templet, and the tool just touched the work, we locked the turret and fed the cross-slide by hand. The ball bearing traveled along the templet and pushed the apron of the lathe toward the work, cutting the required taper. *L. Smith, Yorkshire, England*



Torque-Reading Screwdriver

Often it is necessary to apply a torque within narrow limits when driving screws, to avoid breaking threads or having parts poorly assembled. This mechanism will permit such a torque reading.

A spring is inserted into one end of a screwdriver, the other end of the spring being attached to the housing which is added to the handle of the device. The screwdriver has four tapped holes, in one of which a pin is threaded, this pin serving as both indicator and stop.

To assemble, slip the housing over the screwdriver and spring. Then adjust the torque to its proper limit and insert the threaded pin into the proper hole. *B Ertescheik, Birmingham, England*

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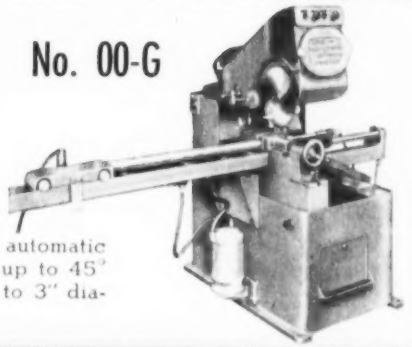
HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N Y

. . . IT'S THE Cost per Cut THAT Counts

Study these high production, low cost figures on three Motch & Merryweather Circular Sawing Machines

Make your own study of the cost per cut in your metal-sawing department. Then find out from Motch & Merryweather how much production at lower cost you can get on M. & M. Circular Sawing Machines, using our Triple-Chip blades.

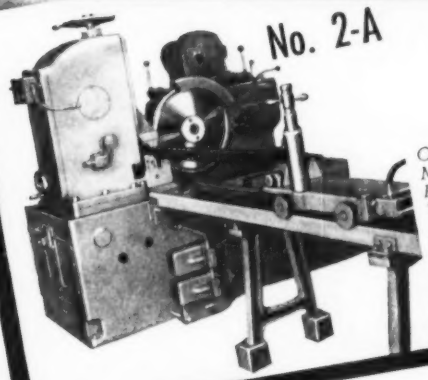
No. 00-G



Operation: Steel door frames (mitre cut).
Material: Rolled steel shapes 6" wide x 1/16" thick.
Production: 200 pieces per hour.
Tool cost per piece: $.0002.

M. & M. No. 00-G Circular Sawing Machine. Manual or automatic stock feed. Readily adaptable to making cuts at angles up to 45° as well as high production square cut-off. Capacity: up to 3" diameter round; shapes—up to 3-3/8" x 6".

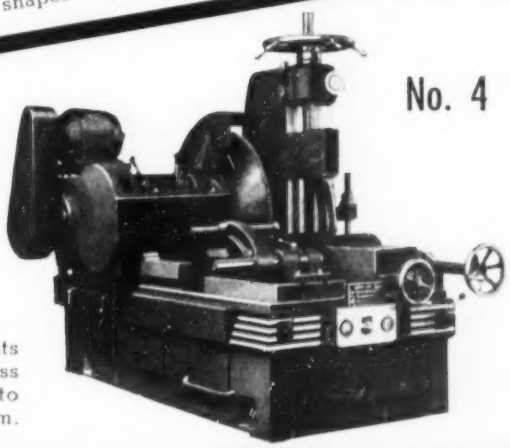
No. 2-A

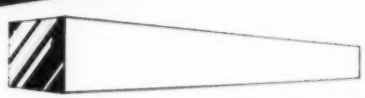


Operation: Rocket nozzle stock cut to length.
Material: S.A.E. 1020, 5" diameter.
Production: 60 pieces per hour.
Tool cost per piece: $.001.

The No. 2-A machine pictured at the left has automatic stock feed up to 72" cut-off lengths. It is offered also with manual stock feed. Capacity: up to 6-1/2" diameter round; structural shapes—up to 5" x 12".

No. 4





Operation: Forging billets cut to length.
Material: S.A.E. 1045, 14" square.
Production: 6 pieces per hour.
Tool cost per piece: $.12.

No. 4. Widely used in steel and structural steel plants and forge plants sawing all types of forging, stainless and titanium alloys, die block steel, etc. Capacity: to 17" dia. round; structural shapes up to 24" I-beam.

Complete size range, ferrous or non-ferrous, up to 43" diameter.

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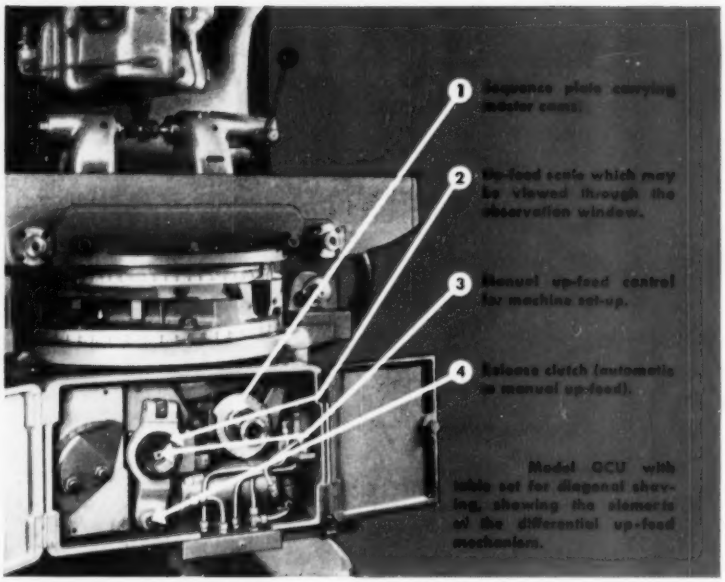
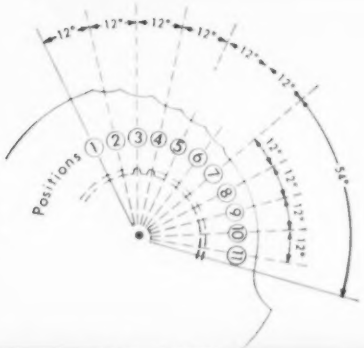


When Automatic Differential Up-feed and Conventional Crowning were added to the Red Ring Model GCU, shaving speed, flexibility and economy were all significantly increased.

AUTOMATIC DIFFERENTIAL UP-FEED

This efficient device provides for the first time an automatic cycle applicable to both diagonal and conventional shaving. This cycle is controlled by an eleven-position master cam. Included are backlash take-up, infeed cutting strokes, idling strokes and return to unloading backlash. The entire cycle or any portion of it may be used depending on job requirements.

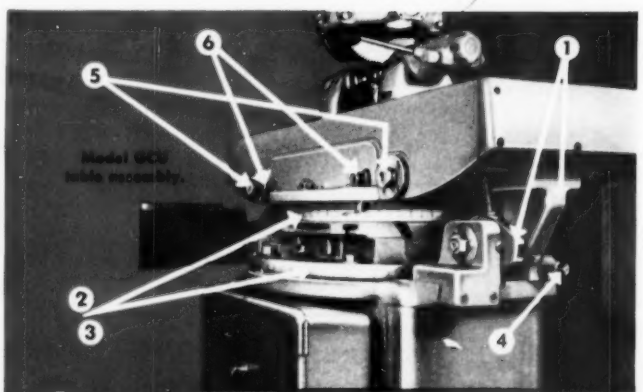
The cam itself does not actuate knee movement. It is strictly a stepped gaging device. Consequently every knee movement is positive, extremely precise and very fast. No danger of operator's errors. Perfect accessibility for fast loading and unloading.



One of the two control cams carried by the feed unit sequence plate.

CROWNING

Gears being shaved conventionally can be crowned by rocking the table about a central pivot during the automatic cycle. The cam controlling the rocking movement is located on table centerline to avoid any tendency to twist. This device also provides for taper shaving.



Write for Bulletin S53-7 for full details.

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ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORM

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American Machinist

REFERENCE BOOK SHEET

Thread-Rolling Trouble Check List...I

By CLIFFORD T. APPLETON, Vice President
REED ROLLED THREAD DIE CO.*

TROUBLE	FLAT-DIE ROLLING	CYLINDRICAL-DIE ROLLING
Slivers or flakes	1. Dies not in match, or 2. Tipped start, or 3. Deep cross-nicking on dies, or 4. Slipping at start, or 5. Improper helix angle on dies, or 6. Machine and dies too large and clumsy for the job, or 7. Overfilling dies, or 8. Material not adaptable to coldworking, or 9. Seamy stock	1. Dies not in match, or 2. Crooked feeding, or 3. Overfilling dies, or 4. Material not adaptable to coldworking, or 5. Seamy stock
Drunken threads	1. Dies not in match, or 2. Tipped start, or 3. Crooked relief on dies, or 4. Slipping at start, or 5. Improper helix angle on dies, or 6. Inaccurate dies	1. Dies not in match, or 2. Crooked feeding, or 3. Inaccurate dies
Offsize threads:		
1. PD and OD both oversize	Oversize blanks	Oversize blanks
2. PD oversize, OD right size	Oversize blanks. If finished thread is full, die thread is too shallow	Oversize blanks. If finished thread is full, die thread is too shallow
3. PD oversize, OD undersize	Insufficient squeeze on dies. If finished thread is full, die thread is too shallow	Insufficient squeeze on dies. If finished thread is full, die thread is too shallow
4. PD right size, OD oversize	Blank too large. Die thread deeper than necessary	Blank too large. Die thread deeper than necessary
5. PD right size, OD undersize	Blank too small. If finished thread is full, die thread is too shallow	Blank too small. If finished thread is full, die thread is too shallow
6. PD undersize, OD oversize	Too much squeeze. Die thread deeper than neecssary	Too much squeeze. Die thread deeper than necessary
7. PD undersize, OD right size	Blank too small. Die thread deeper than necessary	Blank too small. Die thread deeper than necessary
8. PD and OD both undersize	Blank too small	Blank too small
Out of round	1. Out-of-round blank, or 2. Too much pressure on finish end of dies, or 3. Poor thread form on the relief of the die, or 4. Dies too short for the job, or 5. If thread is full on one side and not on the other, poor match or crooked start, or 6. Material not ductile enough for coldworking	1. Out-of-round blank, or 2. Crooked feeding, or 3. Too rapid penetration and release, or 4. Material not ductile enough for coldworking
Taper:		
1. PD straight, OD tapered and not filled out on small end	Tapered blank	Tapered blank
2. PD and OD both tapered same way	Tapered blank, and dies set up with taper to match	Tapered blank, and dies set up with taper to match
3. PD and OD tapered in opposite directions and thread not filled out on end with small OD	Dies not squeezed tight enough on edge with large PD and small OD	Dies not squeezed tight enough on edge with large PD and small OD
Thread with expanded lead	Expanded lead in the dies	Expanded lead in the dies
Thread with contracted lead	1. Contracted lead in dies 2. Hard material (Rockwell, 18 and harder) will contract slightly when released from rolling dies. For accurate work, use dies with expanded lead	1. Contracted lead in dies 2. Hard material (Rockwell, 18 and harder) will contract slightly when released from rolling dies. For accurate work, use dies with expanded lead

*Taken from "Engineering Data on Thread and Roll Forming," a copyrighted publication of the author's company.

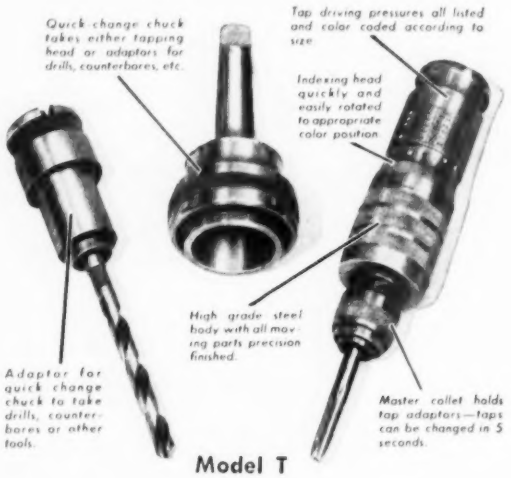
WICKMAN TAPPING ATTACHMENTS
Instant Pre-Selection of Tapping Torques

Pre-selected tapping torques are instantly obtained by presetting the pressure on a two tooth clutch to the required tap size. This is done by means of a highly resilient pressure unit which allows the clutch to slip when tap is overloaded.

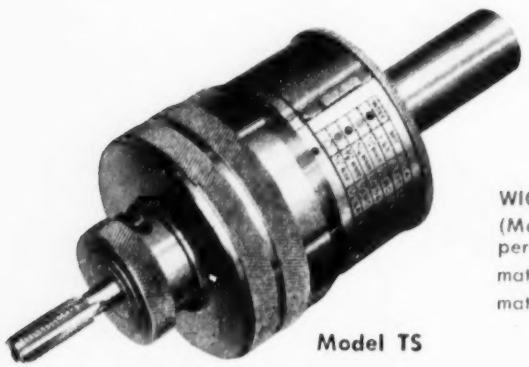
WICKMAN HIGH SPEED TAPPING ATTACHMENTS (Model K) are furnished with Morse Taper Shank attached as an integral unit. Special shanks are furnished on request.

WICKMAN COMBINATION TAPPING ATTACHMENTS (Model T) are designed to fit readily into or be removed from their quick-change chuck even while machine spindle is running. Wickman adaptors for holding drills, counterbores or any other tooling required for your operation can be inserted in the same chuck.

Models K & T sizes and range: from 3/16" to 1 3/4".


Quick-change chuck takes either tapping head or adaptors for drills, counterbores, etc.
Tap driving pressures all listed and color coded according to size
Indexing head quickly and easily rotated to appropriate color position
High grade steel body with all moving parts precision finished.
Adaptor for quick change chuck to take drills, counterbores or other tools.
Master collet holds tap adaptors—taps can be changed in 5 seconds.

Model T



Model TS

WICKMAN TAPPING ATTACHMENTS FOR TURRET LATHES (Model TS) are considerably shorter than Models K & T. They also permit presetting of tapping torque required for any tap size or material, thus preventing tap breakage in blind hole tapping or materials difficult to tap.

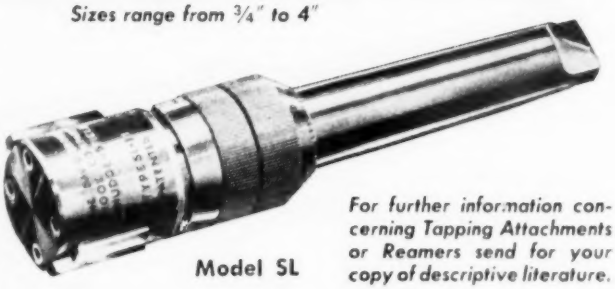
Model TS sizes and range: from 3/16" to 1".

WICKMAN-BROWN ADJUSTABLE FLOATING REAMERS

Sizes range from 3/4" to 4"

Equipped with fully floating blades and direct reading micrometer adjustment, Wickman-Brown Reamers do not require special tools for setting. Reamers may be operated rotating or stationary and are furnished with either high speed or carbide tipped blades.

Wickman-Brown Reamers assure absolute accuracy, complete concentricity and superfine surface finish on both through and blind hole reaming.



Model SL

For further information concerning Tapping Attachments or Reamers send for your copy of descriptive literature.

THE Wickman MANUFACTURING CO.

10325 CAPITAL AVENUE
OAK PARK (Detroit 37), MICH.

Thread-Rolling Trouble Check List...II

TROUBLE	FLAT-DIE ROLLING	CYLINDRICAL-DIE ROLLING
Poor thread form	1. Poor thread form in the dies, or 2. Dies not in match, or 3. Crooked start, or 4. Machine and dies too large and clumsy for the job	1. Poor thread form in the dies, or 2. Dies not in match, or 3. Crooked feeding
Line running axially down one side	1. Insufficient relief on the stationary die and too much pressure on the finish end, or 2. Not gradual enough release of pressure at finish end, or 3. Dies too short for the job	
Thread filled out in center but not at ends, or vice versa	1. Face of die not flat, or 2. Blank with varying diameter from end to end	1. Die with varying diameter from end to end, or 2. Blank with varying diameter from end to end
End threads not filled out	This is characteristic of thread rolling but can be minimized by beveling ends of blanks	This is characteristic of thread rolling—but can be minimized by beveling ends of blanks. Can be somewhat improved by longer, slower penetration cycle
Split thread	1. Seamy stock, or 2. Too much pressure on dies, usually at finish end, or 3. Dies too short for the job	1. Seamy stock, or 2. Too much pressure on dies
Poor finish on thread	1. Correspondingly poor finish on dies, or 2. Dies that are worn out or broken, or 3. Dies not in match, or 4. Slipping, or 5. Deep cross-nicking on start, or 6. Material not ductile enough for cold-working	1. Correspondingly poor finish on dies, or 2. Dies that are worn out or broken, or 3. Dies not in match, or 4. Material not ductile enough for coldworking
Crests not filled out. Many users do not consider this a serious objection, and by allowing their screws to pass with crests not filled out, overloading of dies is avoided and die life is prolonged	1. Blank too small, or 2. Die thread too deep	1. Blank too small, or 2. Die thread too deep. Can be somewhat improved by longer, slower penetration cycle
Scuffed crests (two-cylindrical-die type only)		1. Rough work support blade 2. Soft work support table 3. Improper oiling
Hollow work hole closes in		1. Needs supporting arbor 2. Penetration rate too rapid
Hollow work, hole enlarged		1. Arbor too tight 2. Penetration rate too rapid 3. Blank too large on OD
Hollow work, out of round		1. Penetration rate too rapid 2. Too little dwell with dies fully closed 3. Too rapid opening of die
Hollow work, tapered thread due to uneven wall thickness or support from an adjacent section		1. Improper arbor, not giving support where needed 2. Penetration rate too rapid 3. Taper of dies not great enough to compensate for tendency of work to taper, or 4. Too thin wall thickness

Dirty Hydraulic Systems cleaned in 50 hours or less by SUNVIS H.D. 700 OILS

No Loss of Production

Sunvis H.D. 700 Oils

- **remove sludge and gums without affecting packings**
- **pick up contaminants and carry them to the filter**
- **prevent rusting of clean parts**
- **are available in viscosities to suit all hydraulic pumps**

Learn more about the advantages of cleaning dirty hydraulic systems with Sunvis H.D. 700 Oils. Call your local Sun Office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AM-11.

INDUSTRIAL PRODUCTS DEPARTMENT
SUN OIL COMPANY

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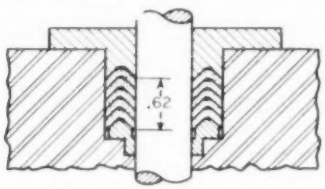
JIC Hydraulic Packings...I

Prepared by the Joint Industry Committee. These data are used for new designs of equipment, or in the specifications therefor, by the automotive and agricultural implement industries, together with other users of hydraulic equipment

STANDARD VEE PACKING - NO ADAPTERS

LV - 40 - .62

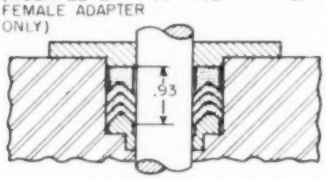
MATERIAL (LEATHER) | TYPE OF PKG (MULTIPLE LIP NO ADAPTERS) | JIC STANDARD PART NO | NORM CONTACT HT OF PKG



STANDARD VEES & FEMALE ADAPTER

FVT - 40 - 93

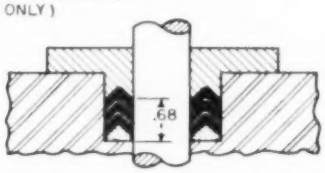
MATERIAL (FABRIC REINFORCED) | TYPE OF PKG (MULTIPLE LIP FEMALE ADAPTER ONLY) | JIC STANDARD PART NO | NORM CONTACT HT OF PKG



VEES & MALE ADAPTER ONLY (NON-STANDARD SIZE)

HVB - 3.12 X 3.87 - .68

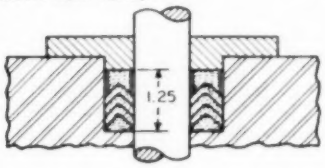
MATERIAL (HOMOGENEOUS RUBBER) | TYPE OF PKG (MULTIPLE LIP MALE ADAPTER ONLY) | NOM OD OF PKG | NOM OD OF PKG | NOM HEIGHT OF PACKING SET

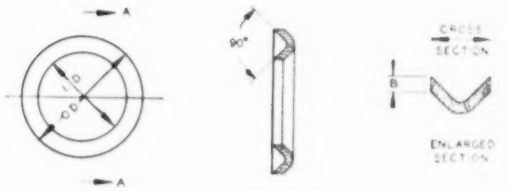


JIG STANDARD VEES & BOTH ADAPTERS

LVA - 40 - 1.25

MATERIAL (LEATHER) | TYPE OF PKG (MULTIPLE LIP BOTH ADAPTERS) | JIG STANDARD PART NO | NOM CONTACT HT OF PKG



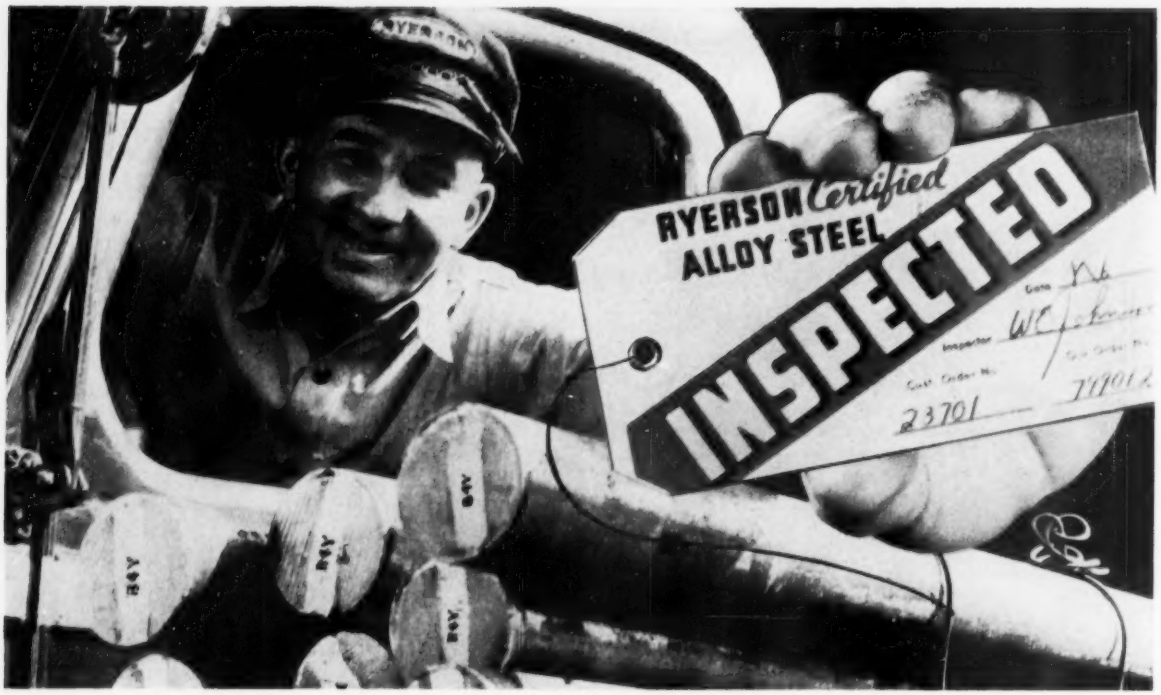


SECTION A-A

TYPICAL APPLICATIONS

NOMINAL SIZES FOR LEATHER OR HOMOGENEOUS V PACKINGS

No.	Cross Section	ID	OD	B ±.010
8	1/4	1/4	3/4	0.083
10	1/4	3/8	7/8	0.083
12	1/4	1/2	1	0.083
14	1/4	5/8	1 1/8	0.083
16	1/4	3/4	1 1/4	0.083
18	1/4	7/8	1 3/8	0.083
20	1/4	1	1 1/2	0.083
22	1/4	1 1/8	1 5/8	0.083
24	1/4	1 1/4	1 3/4	0.083
25	5/16	1 1/4	1 7/8	0.140
26	5/16	1 3/8	2	0.140
27	5/16	1 1/2	2 1/8	0.140
28	5/16	1 5/8	2 1/4	0.140
29	5/16	1 3/4	2 3/8	0.140
30	5/16	1 7/8	2 1/2	0.140
31	5/16	2	2 5/8	0.140
32	5/16	2 1/8	2 3/4	0.140
33	5/16	2 1/4	2 7/8	0.140
34	5/16	2 3/8	3	0.140
35	5/16	2 1/2	3 1/8	0.140
36	3/8	2 1/2	3 1/4	0.156
38	3/8	2 3/4	3 1/2	0.156
40	3/8	3	3 3/4	0.156
42	3/8	3 1/4	4	0.156
44	3/8	3 1/2	4 1/4	0.156
46	3/8	3 3/4	4 1/2	0.156
49	7/16	4	4 7/8	0.197
50	7/16	4 1/4	5 1/8	0.197
51	7/16	4 1/2	5 3/8	0.197
52	7/16	4 3/4	5 5/8	0.197
53	7/16	5	5 7/8	0.197
54	7/16	5 1/4	6 1/8	0.197
55	7/16	5 1/2	6 3/8	0.197
56	1/2	5 1/2	6 1/2	0.197
58	1/2	6	7	0.197
60	1/2	6 1/2	7 1/2	0.197
62	1/2	7	8	0.197
64	1/2	7 1/2	8 1/2	0.197
66	1/2	8	9	0.197
67	1/2	8 1/2	9 1/2	0.197
68	1/2	9	10	0.197
69	1/2	9 1/2	10 1/2	0.197
70	1/2	10	11	0.197
71	1/2	10 1/2	11 1/2	0.197
72	1/2	11	12	0.197
74	1/2	12	13	0.197
76	1/2	13	14	0.197
78	1/2	14	15	0.197
80	1/2	15	16	0.197



danger of wrong alloy

eliminated

by Ryerson 8-step quality control

Two bars of steel may look alike—may actually have been bought as the same alloy—but even seemingly identical bars may vary widely in analysis and performance. To remove completely the risk of getting steel that will not perform as you expect it to—we developed the Ryerson Certified Alloy Plan.

Under this unique Ryerson system of quality control, your protection begins with the careful selection of heats to be carried in stock. Next, we verify the analysis of each selected heat. Then, after spark testing to guard against mixed steels, we permanently identify each bar with a stamped heat symbol and color marking. Meanwhile, we test a sample of every heat for hardenability and interpret the test results for you.

Finally, before these selected steels are shipped, a thorough inspection is made to see that every step in the control plan is followed. Only then, after every detail has been double-checked, is your order of Ryerson alloys approved for delivery. And with your shipment you receive a certificate providing complete test data to prove quality and guide your heat treatment.

You pay no more for Ryerson Certified Alloys, but they will prove real money-savers for you. To get these controlled-quality steels promptly—just call your nearby Ryerson plant.

PRINCIPAL PRODUCTS: CARBON, ALLOY & STAINLESS STEELS—BARS, STRUCTURALS, PLATES, SHEETS, TUBING, MACHINERY & TOOLS, ETC.

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CINCINNATI • CLEVELAND • DETROIT PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

TALKING SHOP

Little Boy Lost

MISSING: One small boy—multiplied by about two generations— who used to stand enraptured and goggle-eyed (sometimes literally as well as figuratively) on the converted cow pasture called an airfield just outside almost any American city. His chief identifying characteristic was that he neglected his chores, maybe played hookey from school, to spend every legal and stolen moment possible listening to the lore of the pilots and the gab of the magicians with baling wire, know as mechanics, who kept in the air the JN-4 'Jennies,' the DH-4s, the Wacos, the Ryans, the Travel Airs and all the other primitive flying machines of that era. When last seen this young man was dedicated, though he would neither have used nor have recognized such a high-falutin' term, to building and maintaining American supremacy in the air. Any information or clue as to why he disappeared or as to his present whereabouts—or as to how to get him back—will be welcomed by the aviation industry, which sorely misses and needs him, and wants him back.—Courtesy *Pegasus*, Fairchild Engine and Airplane Corp

Test Cut

WE RECENTLY WATCHED a heavy-duty cutting test on a production-model 3-34 Gorton miller. A 10-in.-dia inserted-tooth carbide cutter, running at 226 rpm (592 fpm), face-milled an SAE 4150 slab 6 in. thick and 250 Bhn, at 10½, then 13, ipm, with 0.170-in. depth of cut. Cuts were made dry, without upsetting a nickel set on edge on the table, even though the machine was on a roller skid. Seems like modern millers have caught up to carbides, providing the rigidity and power necessary. We went on to take a lighter cut at 2000 rpm (5236 fpm)—grinding-wheel speed. The cutter couldn't take it, at least not dry, but we did get a smoother (almost polished) finish as long as it lasted.

Pin Point

MOST MEN have seen the Lord's Prayon a type slug about ⅛ in. square or on a pin head but did you know it has been engraved on a pin point? The 300 character job was done in 1935 at the plant of George Gorton Machine Co in Racine, Wis, and is still on exhibit there. A platinum-gold alloy was used, on which an area equal to a pin point (about 0.005 in.), twice as thick as a human hair, was polished flat within 0.0001 in. with kid leather, which proved to be the only material soft enough. The tool was 0.10-in. water-hardening steel, with a bullet-shaped point achieved by grinding, then pumice-polishing, and hand stoning to remove irregularities. A standard Gorton 3-F pantograph did the engraving, but all bearings were rechecked and races lapped, then the machine was set on rubber for isolation. Reduction was 400 to 1 from a 2-in. master. Characters are about 0.0002 in. high, and only about 1/40,000 in. deep—so shallow a finger rubbed over them will obliterate them.

In the same size letters, the entire Bible (2,750,000 characters) could be engraved in a ½ x ⅜-in. square.

Low-Pressure Approach

A CANADIAN COMPANY has been experimenting with low-pressure jets to apply coolant. With coolant and shop air at 80 psi directed at milling cutters from below, through jets with 0.010-in. orifices, the method produces a mist of coolant on the work. Expansion of the air adds to the cooling effect. This method has replaced CO_2 on a gang-milling operation, with improved results.

Cutting Corners Helped

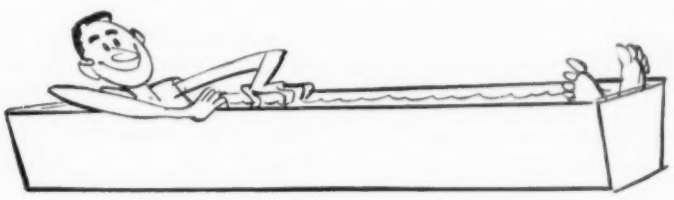
ATTEMPTS to cut costs by trying new methods can hardly be expected to pay off every time. But the search sometimes proves useful in unexpected ways. Reminds us of the company that had been producing pole shoes from rolled stock. Engineers decided to investigate cold extrusion and, going ahead, tooled up for production with the new method. Result was a pole shoe that cost 0.1¢ more than the old one. The payoff came when it was found that in the process it had been necessary to round the corners of the shoe, and this change accidentally saved copper to the tune of several hundred thousand dollars.

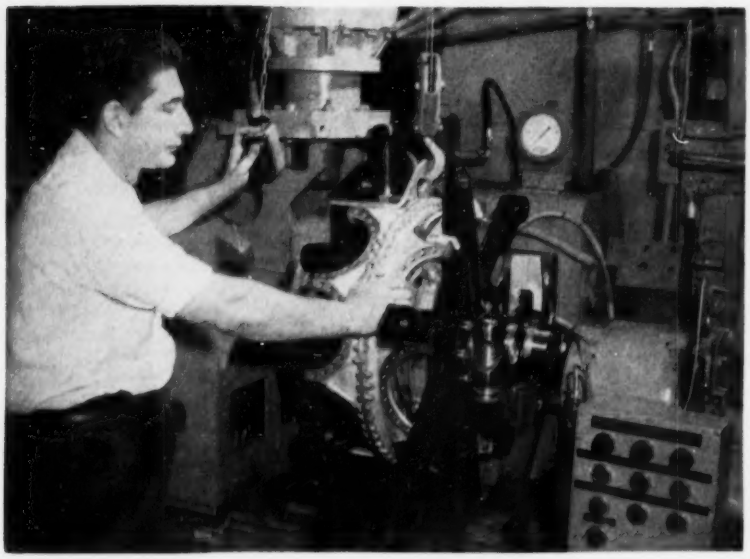
Vive la US

A LETTER from the West Coast the other day informs us that rumor in fair France has it that we are making cutting tools of plastic, and metal cutting tools are therefore outmoded. Letter asked for prices on tools of standard size, method of setup, and speed attained. Evidently the far-famed American know-how has been famed a bit *too* far, or else our leg was being pulled. The query, from an apprentice, may be a variation on the old sky-hook gag, or based on misunderstanding of ceramic tools.

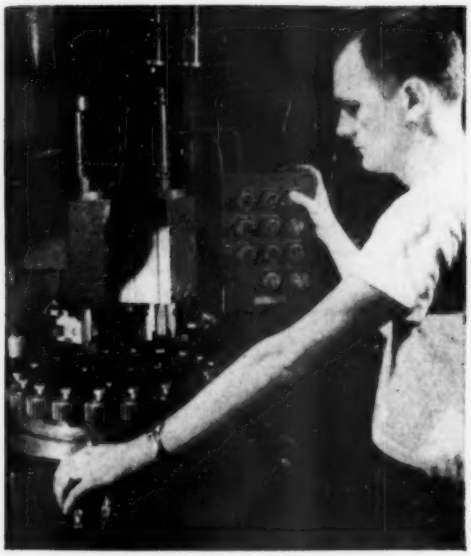
Longest Bath

PIASECKI HELICOPTER has just installed in its plant at Morton, Penna, the world's longest salt baths for isothermal quenching. There are two Ajax furnaces, one containing a bath 1 x 2 x 30 ft, the other 1½ x 3 x 30. They harden hollow pieces of steel over 20 ft long, of varying section shape and thickness, which become spars in the H-21 *Work Horse*, fastest and highest-flying helicopter. Spars are suspended over the hot bath for preheating, then immersed for a cycle, after which they are quenched in the other, low-temperature, bath.





1 Specially-designed machine assembles master and connecting rods to three crankshaft sections within crankcase. Machine maintains proper clearances and bolt stretches



2 Capscrews are torqued and fasteners crimped by pinion ring carrier machine. Note reduction gear pinions

Curtiss-Wright Automates Turbo-Compound Engine Assembly Line at Wood-Ridge

WOOD-RIDGE, NJ — An automated assembly line that cuts costs in half, and is the first such installation in aviation-engine history, was unveiled Nov. 12 by Roy T Hurley, chairman and president, Curtiss-Wright Corp. The line is completely efficient, whether operating full-blast or partially manned. From plant officials, it was learned that the cost of the equipment will be recovered in one or two years.

$1 Billion Backlog

Right now, Curtiss-Wright employs over 30,000 people, its backlog is about one billion dollars, and production activity will grow into next year, then level off for a considerable period. Mr Hurley is proud of the fact that Curtiss-Wright is paralleling the manufacturing efficiency of large auto producers, by turning out $14,000 worth of goods per man per year.

Automated Assembly Line

Development of the automated assembly line was undertaken to cut costs and improve quality of an engine that Curtiss-Wright believes will have a life of at least 15 years. Thousands of turbo-compound engines are on order by military sources plus 22 major airlines, domestic and foreign. Net efficiency of the turbo-compound is twice the turbojet, and the turbo-compound has not reached the end of development in power output nor efficiency.

Capscrew Torqueing Machines

The automated assembly lines are notable for special capscrew torqueing machines, and a conveyor and belt system that moves parts along progressively from the time they are taken off shelves in finished stores. Production capacity has been increased 250% and the new assembly line takes 42% less space than the former setup. Automatic machines that do everything from assembling a complete crankshaft to tightening bolts and crimping fasteners have been built to order. Some of the automation equipment is five times faster than the best skilled workers, and the work produced is uniform and to the highest quality standards.

Turbo Compound Assembly

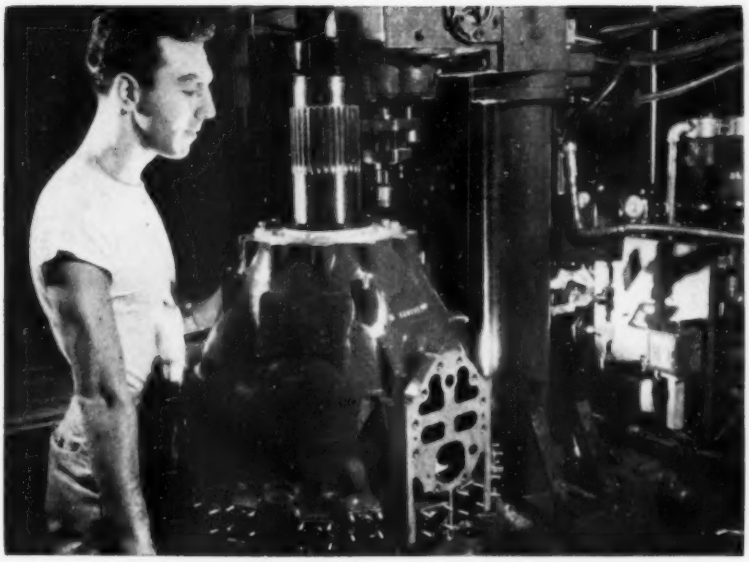
Turbo compounds are assembled on a "green line," then mounted in an oil rig that pumps oil through the engine under pressure, to test for leaks, bearing fits, any maladjustment or inaccuracy in assembly. Then, after washing, the engines are run 4½ hr, torn down, inspected, and then re-assembled on another automated line called the "final line."

The green line is typical of the processing procedure. Main engine parts are moved from finished stores on carriers over a roller floor-type conveyor to the conveyor loading area. Parts are placed on protective-coated pallets, washed and moved to the green-assembly benches and stations. Minor parts are brought to these points in rolling bins.

Bench Assembly Area

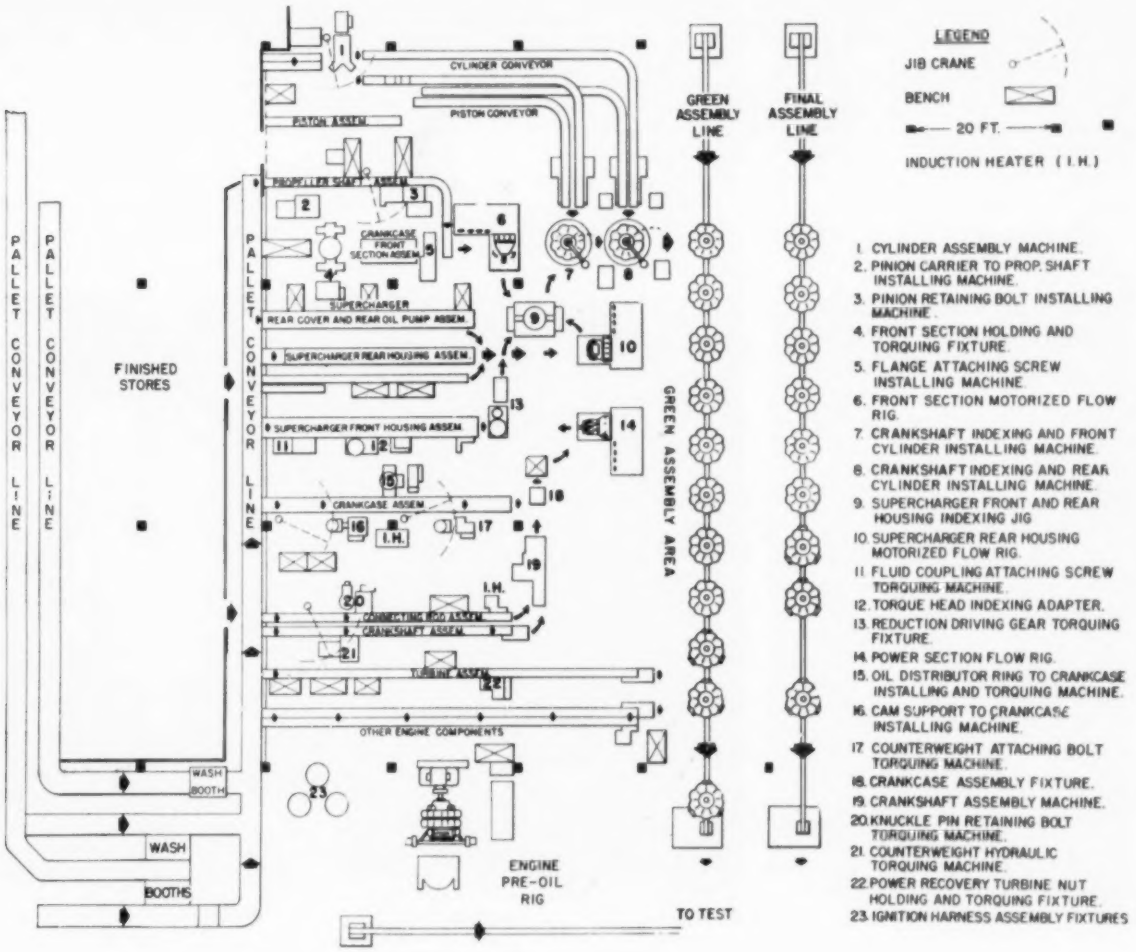
The bench assembly area consists of 15 conveyor lines, from which detailed parts are removed, placed in either automatic torque or assembly machines or fixtures, and assembled into various sub-assemblies such as cylinders, crankcase front sections, rear housings, etc. Sub-assemblies are placed on conveyor pallets, moved to the end of the line, placed in slings and moved by monorails to the pre-line assembly.

The pre-line assembly area includes seven stations where assembly of the various sub-assemblies into the basic engine, excluding external parts, takes place. Parts and sub-assemblies are assembled by fix-



3 Engine front section has been assembled to the point where an automatic torqueing machine is tightening capscrews adjacent to the splined propeller shaft. Front section is virtually ready for oil-rig test

4 Engine tappet housing is securely assembled to rear crankcase by another special machine


PALLET CONVEYOR LINE
PALLET CONVEYOR LINE
PALLET CONVEYOR LINE
FINISHED STORES
CYLINDER CONVEYOR
PISTON CONVEYOR
PISTON ASSEM.
PROPELLER SHAFT ASSEM.
CRANKCASE FRONT SECTION ASSEM.
SUPERCHARGER
REAR COVER AND REAR OIL PUMP ASSEM.
SUPERCHARGER REAR HOUSING ASSEM.
SUPERCHARGER FRONT HOUSING ASSEM.
CRANKCASE ASSEM.
I.H.
I.H.
I.H.
CONNECTING ROD ASSEM.
CRANKSHAFT ASSEM.
TURBINE ASSEM.
OTHER ENGINE COMPONENTS
GREEN ASSEMBLY LINE
GREEN ASSEMBLY AREA
FINAL ASSEMBLY LINE
WASH BOOTH
WASH BOOTHS
ENGINE PRE-OIL RIG
TO TEST
LEGEND
JIB CRANE
BENCH
20 FT.
INDUCTION HEATER (I.H.)
1. CYLINDER ASSEMBLY MACHINE.
2. PINION CARRIER TO PROP. SHAFT INSTALLING MACHINE.
3. PINION RETAINING BOLT INSTALLING MACHINE.
4. FRONT SECTION HOLDING AND TORQUING FIXTURE.
5. FLANGE ATTACHING SCREW INSTALLING MACHINE.
6. FRONT SECTION MOTORIZED FLOW RIG.
7. CRANKSHAFT INDEXING AND FRONT CYLINDER INSTALLING MACHINE.
8. CRANKSHAFT INDEXING AND REAR CYLINDER INSTALLING MACHINE.
9. SUPERCHARGER FRONT AND REAR HOUSING INDEXING JIG
10. SUPERCHARGER REAR HOUSING MOTORIZED FLOW RIG.
11. FLUID COUPLING ATTACHING SCREW TORQUING MACHINE.
12. TORQUE HEAD INDEXING ADAPTER.
13. REDUCTION DRIVING GEAR TORQUING FIXTURE.
14. POWER SECTION FLOW RIG.
15. OIL DISTRIBUTOR RING TO CRANKCASE INSTALLING AND TORQUING MACHINE.
16. CAM SUPPORT TO CRANKCASE INSTALLING MACHINE.
17. COUNTERWEIGHT ATTACHING BOLT TORQUING MACHINE.
18. CRANKCASE ASSEMBLY FIXTURE.
19. CRANKSHAFT ASSEMBLY MACHINE.
20. KNUCKLE PIN RETAINING BOLT TORQUING MACHINE.
21. COUNTERWEIGHT HYDRAULIC TORQUING MACHINE.
22. POWER RECOVERY TURBINE NUT HOLDING AND TORQUING FIXTURE.
23. IGNITION HARNESS ASSEMBLY FIXTURES

5 Power and front sections are on stand: the rear section is being maneuvered into position. When front section is pointed downward, the rear part is placed in position by the men and the automatic machine

6 Front row pistons and cylinders are being assembled. Engine, on stand, is clamped in special machine that indexes engine and rotates propeller shaft so that connecting rods extend for piston assembly

tures and special machines designed to position the work in front of the operator at convenient height.

Green-line final assembly consists of a series of progressive stations with an engine positioned at each. Each engine, previously positioned vertically on a rolling stand, is moved by a floor conveyor at a pre-determined cycle time, while external parts are added.

The new automated assembling line occupies only 68,881 sq ft of floorspace. Top production capacity is withheld for security reasons. Finished stores area remains unchanged at 27,783 sq ft, but the new assembly-line procedure has increased capacity of engine parts by 50%. Now the major sections for 150 turbo-compound engines can be accommodated, plus minor sections for 400 engines.

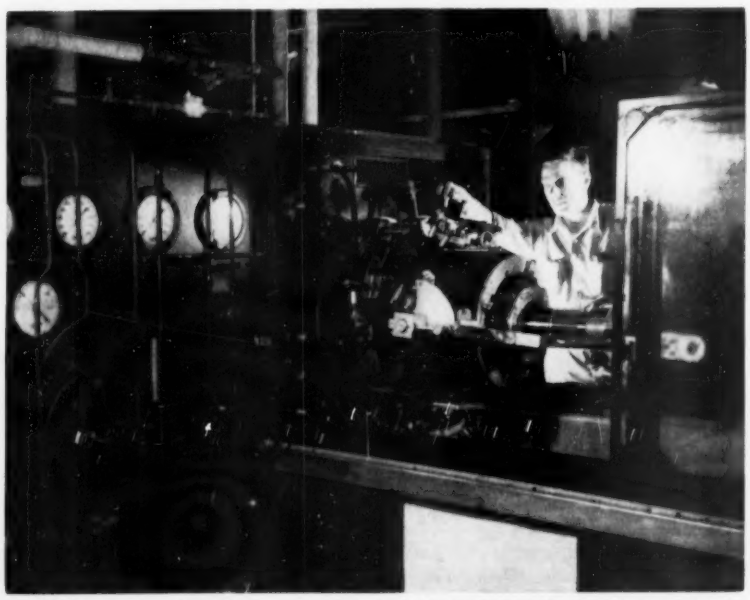
Curtiss-Wright has installed a series of machines and rigs to test the quality of vendor parts before application to the 3500 plus hp engine. For example, stands check fuel injection nozzles, calibrate fuel injection pumps, and discover leaks in individual pieces of tubing. Thus, in every phase of the assembly activity, machines and devices save effort, assure uniform quality and avoid the variations too-often introduced by human error.

CANADA-US ECONOMIC BOARD CALLED "WINDOW DRESSING"

WASHINGTON—The new Canadian-US Economic Board of key cabinet members of the two countries won't affect trade in hard goods one way or the other. It's more window dressing for President Eisenhower's official visit to Ottawa than anything else.

True, the Board may be marginally useful in lubricating friction between the two countries' trade policies, but it won't really affect policymaking in either Washington or Ottawa. And most of the trade problems the Board will consider will be in the field of agricultural products.

Canadian metal goods manufacturers would, of course, welcome easier access to the US market—just as their US opposite numbers would like to see Canadian import restrictions relaxed. But at the moment there's little likelihood of any change in trade policy.



7 Oil flow rigs check for proper oil flow through bearings and channels in three major sub-assemblies—front, power and rear sections—and flush out any foreign matter in a 30-min test. Front section is shown in rig

Mitchell Ouster as Small Business Administration Head May Ease Tight Loan Restrictions

WASHINGTON — The government's tight purse strings for small business loans are about to be unloosened a bit. That's what can be expected from the recent firing of William D Mitchell as first administrator of the Small Business Administration. Congressional friends and professional Washington partisans of small business, who were mainly responsible for Mitchell's ouster, think there's plenty of loosening that can be done.

Mitchell, a Denver lawyer, proved to be a hard man on lending. Direct lending was given a back seat in his plan of operations, with emphasis on long-range, rather than short-term credit needs. His pitch was to generate private lending by promoting local credit pools.

Mitchell planned to limit SBA lending for the most part to "participation loans," with SBA assuming a small part of a loan made by a private lending institution, or obligating to assume a portion of a loan while a bank advanced the full loan immediately.

To the irritation of small business boosters, Mitchel also planned to emphasize management and engineering consulting, rather than direct lending, as SBA's major function.

When SBA was created July 30, it was authorized only $50 million for making $150,000 maximum loans to small companies. Mitchell quickly proclaimed a 60-day moratorium on loan applications, to the dismay of potential borrowers.

So far the agency has made no loans. Its 30 regional offices have okayed 51 loan applications totalling $2.25 million, mostly from metal-working companies — but Washington will have the final say.

Mitchell's foes admit that SBA's authorized funds are inadequate to support much of a small business lending program. But they contend that Mitchell should have made a more aggressive mark by making some quick loans to demonstrate administration interest.

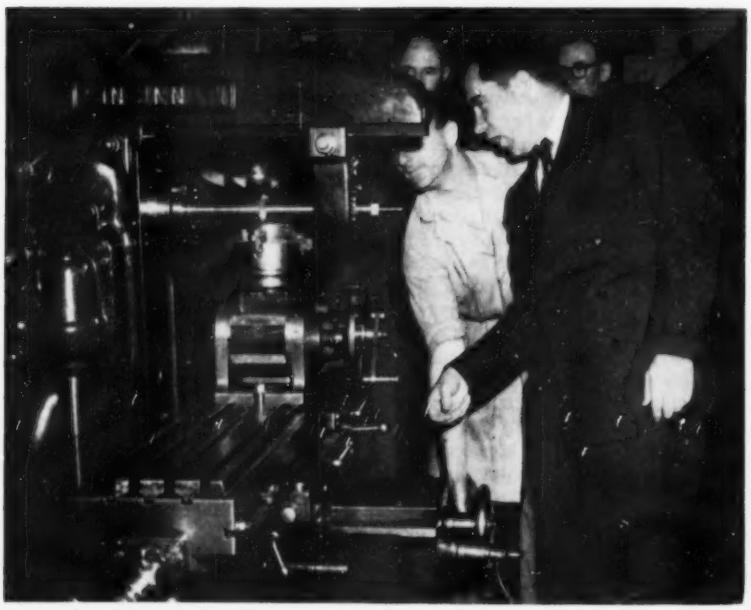
Some observers feel that Mitchell was made fall guy for the administration's exploratory small business lending policy, and that he had reflected the ultra-conservative views of his policy board, consisting of Treasury Secretary Humphrey, Commerce Secretary Weeks.

With Mitchell's departure, SBA policy will presumably be liberalized. At press time, Richard Dyer, US Steel Corp assistant treasurer, was being talked up as Mitchell's successor. He is a onetime RFC official and served as loan defense chief for the Small Defense Plants Administration. Meanwhile Wendell B Barnes, SBA's general counsel, is acting administrator.

G-M BUYS WILLOW RUN FOR $26 MILLION

DETROIT — General Motors Corp, lessee of Kaiser Motors Corp's Willow Run plant here since G-M's disastrous fire at its Livonia, Mich, Hydra-Matic plant this summer, purchased Willow Run on November 10 for $26 million.

G-M until now had leased only about 40% of Willow Run (1.5 million sq ft). Now, with purchase of the entire plant, G-M will have 3.5 million more sq ft of Hydra-Matic manufacturing space. But under contract terms, Kaiser will lease back space it now occupies for a period not to exceed 12 months. Indications are that Kaiser will immediately start transfer of equipment to Toledo.



VICE-PRESIDENT NIXON SEES AUSTRALIA AT WORK, on his fact-finding tour of the South Pacific. Visiting Colonial Sugar Refinery's Sidney plant, Mr Nixon inspected an American-made milling machine (left), and stopped to get the Australian workingman's viewpoint on productivity and working conditions from lathe operator Bob Hall

PRESIDENT
Herbert L Tigges
Executive Vice President
Baker Brothers, Inc

1ST VICE PRESIDENT
Milburn A Hollengreen
President and General Manager
Landis Tool Co

2ND VICE PRESIDENT
Louis Polk
President
Sheffield Corp

NMTBA Meeting Urges Retention of Tariff Barriers, Non-Leasing of US Machine Tools

BOCA RATON, FLA—US builders of machine tools have an unparalleled opportunity to convince buyers that they must replace obsolete machines of which there are more than ever before in history.

- The tariff on machine tools should not be lowered further to permit importation of tools made at low labor costs and priced at less than US tools.
- Surplus government machines should not be sold or leased but held as standby equipment for emergency production needs.

These were some of the conclusions brought out at the 52nd Annual Meeting of the National Machine Tool Builders Association at the Boca Raton Hotel and Club November 10-13. For the first time the NMTBA spread its business sessions over three days instead of two.

Tigges Elected President

Herbert L Tigges, executive vice president of Baker Brothers Inc, was elected Association president. Other officers are: Milburn A Hollengreen, president and general manager, Landis Tool Co, first vice president; Louis Polk, president, Sheffield Corp, second vice president; John C. Cotner, president and gen mgr, Hydraulic Press Mfg Co, treasurer. Directors elected were Everett M Hicks, vice president, Norton Co; William E Rutz, executive vice president, Giddings & Lewis Machine Tool Co, and Mr Polk.

Four Tasks Set

Four tasks face the machine tool industry, Swan E Bergstrom, Vice President Cincinnati Milling Machine Co, said in his address as NMTBA president.

- An engineering job so superior that US tools can command the premium price that they must have to exist in world markets.
- Working intelligently with government agencies to provide them with information to appraise realistically the importance of the industry to the national welfare.
- Provide strong, alert, aggressive, hard-hitting sales forces.
- Tapping the biggest market of all — the replacement market. Both builders and distributors have a great sales responsibility.

"This country can be prosperous and safe only by maintaining modern, efficient and aggressive industrial plants," Mr Bergstrom asserted. "Back of all this must stand a modern and efficient machine tool industry."

He expressed strong opposition to lowering the US tariff on machine tools below the present 15% level. He pointed out that the US import duty rates are among the lowest in all the machine tool producing nations. This country requires no import licenses so common elsewhere.

Brussels Fair

Mr Bergstrom declared that some of the machine tools at the recent Brussels Fair, built by European companies, "were well-designed and would be competitive in any part of the world." Some of the machines in European automobile plants are as far advanced in automation as machines in US car factories.

The fact that only 25 American builders out of a total of 748 exhibitors of all nationalities showed their machines at Brussels was "disappointing and shocking," Ralph J Kraut, president and general manager, Giddings & Lewis Machine Tool Co, said in his report as Chairman of the Subcommittee on Overseas Markets. He expressed the belief that if America is to regain its export position, builders must participate in foreign affairs, including the Fourth European Machine Tool Exhibition at Milan, Italy, in September 1954.

Export Decline

The serious decline in US machine tool exports can be traced to these factors, Mr Kraut said:

- Domestic defense demand and government regulations preventing normal export shipments.

TREASURER
J C Cotner
President and General Manager
Hydraulic Press Mfg Co

DIRECTOR
William E Rutz
Executive Vice President
Giddings & Lewis Machine Tool Co

DIRECTOR
Everett M Hicks
Vice President
Norton Co

• Closing of certain markets for political purposes—China, Russia and even Japan until recently;

• Sharp increase in foreign competition, with well over 1,000 competitors in Western Europe employing more than 200,000 workers;

• Prices that are 50% to 100% above foreign builders' prices;

• Shortage of US dollars abroad;

• Absence of government subsidies at the disposal of European builders and of extended terms of payment offered by English and German builders;

• Obstacles offered by foreign duties, import restrictions and US export licensing set-up.

Foreign Market Not Lost

Mr Kraut made clear his conviction that export markets for US machine tools are not lost. He believes "Our designs are better, more rugged, more reliable, more productive," and "our engineering skills and imagination should widen that gap in the future." US builders get three times the production per worker as the Germans. Foreign building costs are bound to rise.

US Machines Better Designed

Though foreign machines got a toehold in the US market during the Korean emergency period, Mr Kraut is of the opinion that they still are generally unacceptable in rigidity, horsepower, output and reliability. There is little to fear from them, as US builders hold most of the trump cards—better designs, competitive prices, better deliveries, vastly better service and responsibility, a much better sales engineering concept of tooling and production.

Liberalized Depreciation Seen

Some form of liberalization in depreciation regulations on capital equipment is likely to be adopted by Congress at its next session, Lloyd D McDonald, executive vice president, Warner & Swasey Co, predicted in reporting as chairman of the tax policy committee. He urged all members "to preach the gospel of optional depreciation" because only with a change in depreciation rates can the proper rate of modernization of equipment be attained.

Standardization

Highest possible degree of standardization and uniformity in contract forms and clauses used in government machine tool procurement is the machine tool industry's objective, Mr Tigges reported as chairman of the subcommittee on procurement policy. Another objective is to negotiate a uniform machine tool contract with the Defense Department. The committee has suggested important changes in the inspection clause in present regulations. Other proposed changes, Mr Tigges said, are to make mandatory FOB plant shipments, to put upon the buyer the risk of loss once the machine has left the plant, and to do away with special specifications for electrical installations. Painting, packaging and operating manuals.

Administration Plans

The Eisenhower administration is determined to develop and maintain a strong mobilization base and "the cornerstone of the base program is a healthy machine-tool industry," Arthur S Flemming, director, Office of Defense Mobilization, declared. If this industry is to remain healthy, Washington must be willing to keep in readiness the equipment and facilities currently used for the partial mobilization program and must provide prior to M-Day for long-lead time machines and facilities required by full mobilization.

More Elephant Tools

Mr Flemming revealed that the government's plans call for creation of capacity to build 450 additional elephant tools a year over and above existing capacity. Three programs have been approved to provide capacity for 119 more units and a fourth program is under consideration for an additional 84 units. No further commitments will be made until the new end-item needs of the Defense Dept are known. Congress has made available to the Defense Dpt $250 millions for fiscal 1954 to acquire long lead-time tools and to acquire equipment and facilities.

Leasing of US Tools

Beyond that, the Department has available $600 million from previous appropriations for this purpose. Projects for which this money is to be used may cover "construction, modification or acquisition of facilities as well as acquisition of tools and facilities." No government-owned machine tools will be sold or leased

(Continued on page 176)

NMTBA MEETING (Continued)

for non-defense work without consultation with the Dept of Commerce and Small Business Administration. The machine-tool industry also will be asked to express its views, Mr Flemming said. He also pledged the administration to put into action the Vance Plan.

Vance Plan

The Defense Dept has in preparation an order setting up the criteria of what tools are to be maintained, preserved and rehabilitated under the Vance Plan, Ralph S Howe, executive vice president, New Britain Machine Co, and chairman of the Sub-Committee on Permanent Defense Capacity, declared.

There will be four classes of government machines: (1) package plants, (2) equipment identified with a military end-item or contract, (3) "hard to get" and long lead-time machines, (4) surplus not suitable for any end item. Condition of equipment in these classes will be charted and a five-year program laid out to implement it. Ordnance and the Air Force have already made a start.

Non-Military Leasing

Mr Howe described a second order establishing criteria covering the leasing of Defense Dept equipment for non-military use. Lease agreements made solely on the basis of savings in maintenance costs to the government will not be considered sufficient reason for submission for approval. A certain number of government machine tools inevitably are becoming idle as a result of elimination of certain military end items and technological improvements, he said.

The machine-tool industry must help the government to devise an orderly procedure for disposal of those machines which will be least harmful to industry.

Annual Report

It is startling to an American machine-tool builder to find so many youngsters in training in German and Swiss plants, NMTBA General Manager Tell Berna said in his annual report. The Fortuna Werke in Germany, for example, has 800 employees and 110 apprentices.

Every US company, Mr Berna said, should provide for training of young men. He mentioned a proposed revision of electrical standards for machine tools that, if approved by NMTBA members, will be suggested as an American standard to replace the war standard adopted in 1942. The JIC standard will be submitted at the same time as an alternate standard for mass-production industries. And new hydraulic press standards should be completed by year's end, Mr Berna reported, adding that mechanical press standards, however, are not as far along.

Perrin G March III, assistant administrator, Business and Defense Services Agency, and president, Cincinnati Shaper Co, outlined activities of the successor to NPA

How BDSA Works

The Metalworking Equipment Division of BDSA is handling such matters as administration of priorities, recommendations to ODM on tax authorization and to GSA on facilities contracts and problems of mobilization planning and post-attack production planning.

Mr March's comments on the machine-tool situation pertaining to defense are on p111.

US-Canadian Methods Discussed At SAE Production Forum

TORONTO — The first International Production Meeting and Forum held by the Society of Automotive Engineers featured eight simultaneous panel discussions on production problems.

Problems of reconciling smaller Canadian production to larger US production in the automotive field were considered in one panel. Production techniques have to be altered. For example, instead of using individual machines for welding operations, it may be possible to tool one machine to turn work and handle several welds. There was considerable discussion as to how far the Canadian manufacturer can deviate from US designs. It was generally felt that the service problem was the controlling factor here.

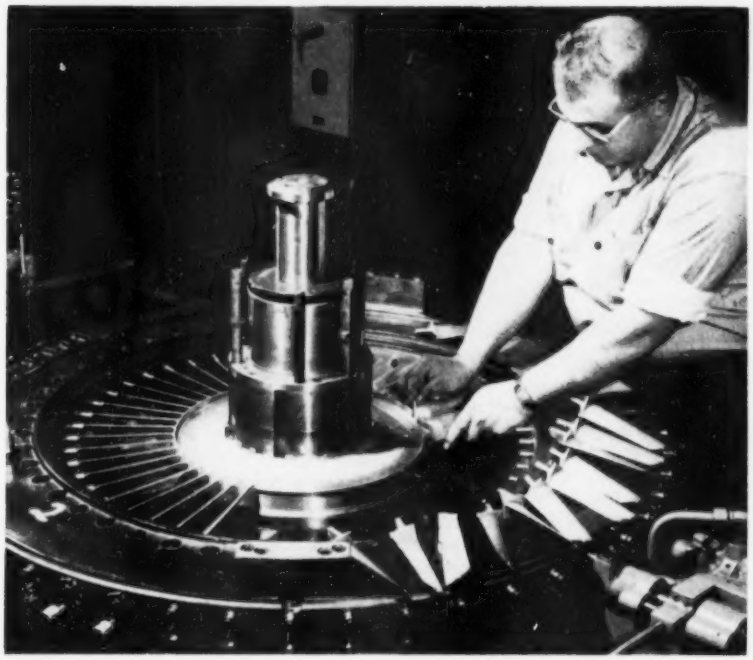
In the production tooling panel there was discussion of replacement programs. Several of those present pointed out that because of Canada's accelerated write-offs at 20% of depreciated value each year, the MAPI formula is less applicable than in the US. It was felt that there was a place for multi-purpose transfer machines in Canada, but they would generally use standardized units with spaces provided to accommodate additional units to handle model changes.

The forging panel went into the need for the .orging engineer to enter into planning from the first design stages. It was felt that the application of automation to forging would be limited to extremely high volume production where no flexibility is required. The trend is to low-draft and no-draft forgings with closer tolerances to eliminate machining.

Aircraft Production

In a technical session on aircraft production, R B McIntyre, de Havilland Aircraft of Canada, discussed production engineering on civil aircraft. There are two intervals in producing a plane—one from start to completion of prototype, a second to solid production. By starting production before design is complete, the two periods can be made to overlap, cutting total time. This requires putting production engineers in the experimental shop. Sometimes a production jig can be started, leaving spaces open. Sometimes permanent tooling can be safely produced for the prototype. Where temporary tooling is required, it may be made capable of producing 20 or 30 parts to handle initial production.

R M Brophy, deputy minister of defense production, reviewed the development of Canada's defense program, which has now reached its peak level. Canada is still faced with a shortage of technical personnel, he said. To date, defense orders have been placed for $4 billion since Korea. Expenditures so far have been $2.8 billion.



ASSEMBLING JET TURBINE BLADES IN THE DISK at Oldsmobile's Lansing, Mich, jet engine plant. Assembly is held in this fixture for drilling dowel holes in outside diameter of disk and blades. Oldsmobile-produced compressor and turbine assemblies for J-65-B-3 jet engines contain more than 1000 blades

Magnesium Association Stresses Need for Public Education Program

NEW YORK—The 9th Annual Meeting of the Magnesium Association drew a registration of about 450 here. While engineers may have learned to understand and use magnesium, the general public is still largely unaware of its existence, according to a survey reported by Frank Howard, Sr, of Howard Foundry Co.

Made in Chicago, the survey taken by a research organization reported on 516 interviews, mostly of people in the middle income group from 20 to 49 years of age. Asked if they knew what magnesium was, 60% of the men and 85% of the women (an average of 78%) could not identify it as a metal or an alloy. Of those who did know, few could name one property of the material. Reaction to this report was that the industry still had a major educational job to do with the public.

Mg Alloy Usage Increases

More encouraging were reports on use of magnesium alloys. G F Hodgson of Doehler-Jarvis reported that use of die castings has increased ten times in the past five years, was about 9000 tons of shipped castings last year. This growth was marked by the changing price relationship that has made magnesium cheaper than secondary aluminum and the ready conversion of aluminum dies to magnesium die casting.

Mg Rolling Mill

Initial operation of the first high speed, high production rolling mill for magnesium was announced at the Madison Div of Dow Chemical Co. Full operation of the new plant will provide new capacity for magnesium sheet and plate, development of which has been restricted by shortages.

Kirkpatrick Reelected President

J S Kirkpatrick, vice president of Brooks & Perkins, was reelected president of the association. L G White, Dominion Magnesium Ltd, was elected vice president; J V Cosman, Superior Bearing Bronze Co, treasurer; and Miss M I Hansen, assistant secretary.

BUSINESS ITEMS

Le Count Tool Works, Inc, is the new name of **W G Le Count Tool Works,** which recently moved to larger quarters in Hartford, Conn from Norwalk.

Rod Cutting Co, Cleveland, has changed its name to the **Cayce Corp** in honor of its founder.

Wilcolator Co, Elizabeth, N J, temperature control manufacturing firm has completed a Canadian manufacturing plant in Toronto.

Follansbee Steel Corp has been awarded a contract to make more than a million 50-cal ammunition boxes for the Pittsburgh Ordnance District.

Wagner Brothers, Inc, Detroit, has purchased metalworking and electroplating industry manufacturing and sales rights for Titeflex Filters from **Atlas Corp.** Wagner is tooling up to build all standard Titeflex models.

Eclipse Fuel Engineering Co, Rockford, Ill, has acquired **Wheaton Engineering Co's Solenoid Valve Division.** Purchase includes complete production equipment, patents, drawings, etc.

Thor Power Tool Co, Aurora, Ill, has formed a Motion Picture Division to produce a complete series of films covering applications of all lines of Thor tools.

Rem-Cru Titanium, Inc's Midland, Pa, plant expects to increase production of titanium 300% in the first six months of 1954 to a total of 10 ingot-tons per day.

Allis-Chalmers Mfg Co officially took over the **Buda Co,** Harvey, Ill, diesel engine manufacturer, on Nov 1. Buda diesels will be used to power A-C farm equipment.

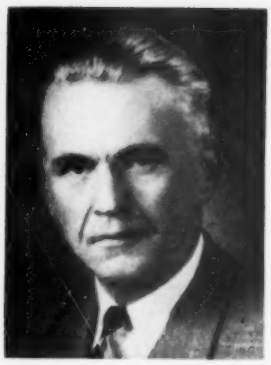
American Machine & Foundry Co has consolidated its three New York offices into one office at 261 Madison Ave, New York.

Firth Sterling, Inc, Pittsburgh, is installing a major independent zirconium melting and rolling facility at its Trafford, Pa, plant. Output will be made available for general industrial use. Firth Sterling is making the installation independent of government support and production will not be committed to government contracts.

R A McCarroll

Mason Britton, Jr

R F Tomlinson



William Bader

Names in the News

R A McCarroll has been named master mechanic at Plymouth Motor Corp's main plant in Detroit. During World War II Mr McCarroll held important supervisory posts in the tooling of defense plants for production of aircraft, aircraft engines, electronic equipment and other war materials. In 1944 he headed all tool and machine designing and building for rockets and smokeless powder at US Naval Ordnance, Indian Head, Md. He joined Chrysler Corp in 1948 and was assigned to the Gear & Axle Plant, where he became assistant master mechanic.

Mason Britton, Jr, has been appointed sales manager of the Cincinnati Lathe & Tool Co. Prior to joining the firm last January as sales engineer, Mr Britton had been associated with the Cincinnati Milling Machine Co since 1946. Responsibilities of Assistant Sales Manager **David A Wallace** have been expanded in field sales. He served as regional sales manager at Chicago until 1952 when he was appointed to his present post in Cincinnati.

Edward Van der Pyl, director of equipment engineering at Norton Co, Worcester, Mass, has retired after a 44-year career with the organization. During his years with the company he was responsible for 45 patents, many of the most important of which are in the field of diamond grinding wheels. He served as resident engineer at the Hamilton, Ont, plant, and the French plant. Later he became assistant plants engineer and general development engineer, prior to his most recent position. Mr Van der Pyl will continue to serve as consultant to the firm.

R F Tomlinson, manager, Conveyor Dept, The Oliver Corp, A B Farquhar Div, York, Pa, has been elected president of the Conveyor Equipment Manufacturers Association. He succeeds **Harry C Davis,** general manager, Kanawha Mfg Co, Charleston, W Va. **Jervis C Webb,** president, Jervis B Webb Co, Detroit, was elected vice president; **E E Boberg,** sales manager, Standard Conveyor Co, North St Paul, Minn, treasurer; and **Russell B Maas,** president Screw Conveyor Corp, Hammond, Ind, secretary. Directors elected were: Mr Davis; **Fred S Wells,** vice president, Stephens-Adamson Mfg Co, Aurora, Ill; and **D E Davidson,** vice president, sales, Link-Belt Co, Chicago. **R C Sollenberger** was re-elected executive vice president to continue as staff head of the association with headquarters in Washington, DC.

M H Hobbs has been named manager of Westinghouse Electric Corp's Switchgear Div; he succeeds **J B MacNeill,** appointed to the staff of John K Hodnette, vice president in charge of industrial products. **C P West,** formerly division engineering manager, has been named assistant to Mr Hobbs. **A A Johnson,** manager of electric utility engineering, succeeds Mr West.

Gilbert T Bowman has been named to the newly-created post of manager of the products department of Rockwell Mfg Co's Meter & Valve Div. **O W Barnett,** former manager of Nordstrom valve distributor sales, succeeds Mr Bowman as valve products manager. **George A Cunningham,** formerly assistant gas products manager, has been appointed manager.

William Bader has been appointed vice president of the new experimental research and product development division set up by the Wesson Co, Ferndale, Mich, and Wesson Metal Corp, Lexington, Ky. Prior to joining the company in 1947, Mr Bader was associated with Tungsten Carbide Tool Co, Div, Michigan Tool. At Wesson he organized the Multicut plant in Brighton, Mich, and since that time has worked on product development.

Dr O G Haywood, Jr, has been named manager of engineering planning of Sylvania Electric Products. In his new position he will coordinate planning in the fields of lighting, radio, electronics, and television, with particular emphasis on the long range future of company engineering. Two years ago Dr Haywood organized the Office of Scientific Research of the Air Research and Development Command in Baltimore, Md, and headed the office until his resignation in September.

Joseph A Anderson has been named general manager of General Motors Corp's AC Spark Plug Div; he succeeds **George Mann, Jr,** retired. Mr Anderson, who will direct activities at both the Flint and Milwaukee plants, has been a member of the organization since 1924, and works manager since 1940.

F L Snyder, vice president of Westinghouse Electric Corp, has reassumed management of the firm's Transformer Div, Sharon, Pa. He is returning as vice president of the division which he managed from 1949 to 1951, at which time he was transferred to Philadephia as manager of the Aviation Gas Turbine Div. Last April he was elected a vice president of the company and assigned to the staff of the executive vice president in charge of defense products.

Neil A Moore

Harry E Moon

Robert A Wagner

A R Schneller

Neil A Moore has been appointed to the newly-created post of general manager of the service division for Spicer products, Dana Corp, Toledo, Ohio. Mr Moore was formerly vice president and general manager of Sealed Power Corp, Muskegon, Mich, and vice president of Federal-Mogul Corp, Detroit.

Harry E Moon has been appointed executive vice president of both the mechanical and plastic divisions of General Industries Co, Elyria, Ohio. Mr Moon joined the organization in 1923; for the past ten years he has been serving as vice president and sales manager, mechanical division.

Marron Kendrick has been elected president of Schlage Lock Co, San Francisco. He succeeds his father, **Charles Kendrick,** who headed the company for 27 years, and will now serve as chairman of the board. Prior to his appointment, Mr Kendrick was vice president and secretary.

Henry J Gardner has been appointed chief engineer, Airmatic Valve, Inc, Cleveland. Mr Gardner, who will be responsible for new product development, was formerly design development engineer for International Business Machines.

Samuel P Hull, vice president of the Worcester Stamped Metal Co, Worcester, Mass, has been elected president of the Pressed Metal Institute. **James M Leake,** president of the Leake Stamping Co, Monroe, Mich, has been named vice president; **Hunter Morrison, Jr,** vice president of Morrison Products, Cleveland, has been elected to serve his third consecutive term as secretary-treasurer. **R W Breckenridge,** former president of Automatic Die & Products Co, Cleveland, has been appointed director of the Institute's new technical and engineering department.

Robert A Wagner has been appointed chief engineer for Hiller Helicopters, Palo Alto, Calif. From 1946 to 1950 Mr Wagner was project engineer for the Hiller 360; he then joined the helicopter division of Hughes Aircraft in Los Angeles. Since 1951 he has been chief engineer of the aircraft division of McCulloch Motors.

Robert L Brownlee, manager of engineering administration of General Electric Co's Carboloy Dept, has been named plant manager of the Distribution Assemblies Dept of the Industrial Power Components Div in San Francisco. Mr Brownlee joined the metals department in 1936, was made assistant to the vice president in charge of manufacturing in 1940, manager of production in 1942, and head of engineering administration in 1952.

A R Schneller has been appointed manager of welding sales for the Pacific Coast region of A O Smith Corp's Welding Products Div. He had previously headed division sales in Wisconsin. **Peter S Blake,** formerly factory manager of the Truck Frame Div at Milwaukee, has been appointed works manager of the company's new automotive frame plant now under construction at Granite City, Ill. Prior to joining the firm in 1947, Mr Blake was associated with Carnegie-Illinois Steel Co.

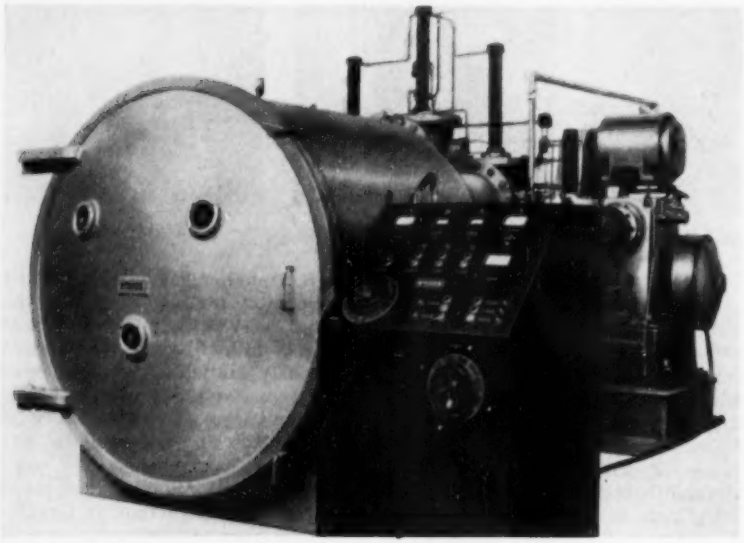
Ray F Ellis has been appointed director of sales, and **Burleigh L Owens,** director of marketing of the Atkins Saw Div, Borg-Warner Corp, Indianapolis. Both men have been serving as assistants to the vice president of sales. Mr Ellis will head all internal sales functions, and Mr Owens will direct outside activity.

OBITUARIES

W Earle Shumway, manager of sales engineering at Norton Co, Worcester, Mass, died Oct 25. Mr Shumway joined the company's research laboratories in 1917, and later became a sales engineer. He served successively as district manager of the Hartford, Conn, office, the Chicago office, manager of the western region, and in 1950 was appointed to the post he held at the time of his death. He was chairman of the safety committee of the Grinding Wheel Institute, and a member of the standardization committee.

Lewis D Spence, 73, retired executive of Brown & Sharpe Mfg Co, and an outstanding authority on the construction and use of automatic screw machines, died Nov 9 in Providence, RI. Mr Spence joined the organization in 1898; in 1921 he was placed in charge of the automatic screw machine drafting department as head of design for machines and tools, in which capacity he represented the company in this country and abroad. He gave up active work in 1943, but continued in an advisory capacity until his retirement in 1949.

New Shop Equipment



Stokes 72-in. Vacuum Metallizer Features Pushbutton Control

Units featuring compactness in the layout of the pumping equipment and a high degree of automation in the control system, with interlocks to guarantee safety, are said to be the largest ever built for metallizing on an industrial production scale.

Rapid pumpdown of the chamber (72 in. in dia, 60 in. long) is accomplished by three-stage pumping system comprising a 500-cfm rotary mechanical pump, a 6-in. booster pump, and three diffusion pumps.

Pumping system can evacuate the empty chamber to a pressure of ½ micron in 7 min. Sequence-operated circuits and interlocking relays are used to insure foolproof operation.

Additional features include: switches supplied with pilot lights; single variable transformer to regulate all three diffusion-pump oil heaters; easy accessibility to wiring; and complete air-filtering and pressure-regulating equipment built into the airlines.

F J Stokes Machine Co, Philadelphia, Pa

Air-Gage Tracer for Monarch Lathes

Monarch has developed a new type C rigid air-gage tracer designed expressly for application to its model EE sensitive precision toolmaker's lathe and model EE precision manufacturing lathe.

Said to provide greater sensitivity and operating convenience than previously obtainable, the new tracer is powered by an exclusive electronic drive. Maximum dia change at one setting of slide is 3 in.

Feed range of hydraulic slide, set at 45°, is such that square shoulders may be turned. Another design feature is the mounting of the tool on its own slide. This can be adjusted for dia changes. Either flat or round templets may be used with this tracer. There is no need to harden templet.

The Monarch Machine Tool Co, Sidney, Ohio

Barnesdril Line of Honing Tools and Stones

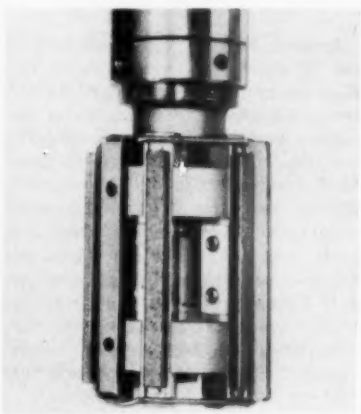
Barnes Drill Co has designed and manufactured a complete line of honing tools and abrasives to complement the development of electric hone expansion and automatic sizing on honing machines. Tools are made in three basic types to properly accommodate the specific type of abrasive honing stone used.

General purpose type A tools are available for the conventional stone and shell assemblies or Barnesdril style A general purpose honing stones for applications involving a range of bore diameters. Principal feature of the tool is the quick-clamp stone holder which also accommodates abrasive sticks which have had protective material added to the sides. End thrust is taken by the holder; protective material prevents stone edge from spalling.

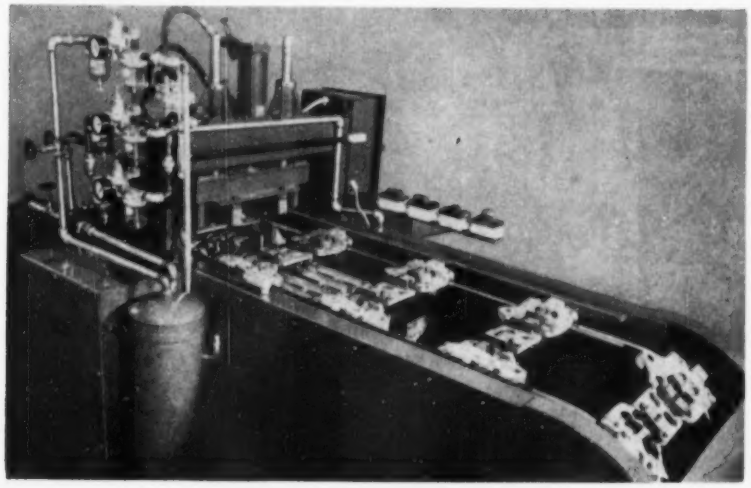
High-production type B tools accommodate style B abrasive stones for general applications. Body is of flange type with slots supporting stone for its full length. Stone is supported by steel holder which transmits expansion pressure to stone. Protective material covers sides of stone and extends down to provide holding skirt.

High-production type C tools are most adaptable for specific applications and small-dia work. Stone holders are not required—stones are held in position by controlled friction and quickly inserted or removed. Use of high percentage of full depth of honing stone is possible with this design.

Barnes Drill Co, Rockford, Ill.



Materials and Parts

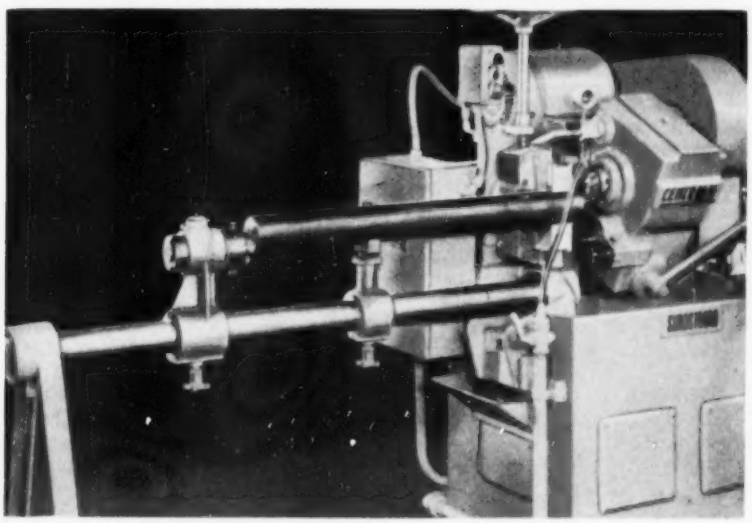


Resistance Welding Machine Uses Over-and-Under Automation

Machine welds retainers to valve gasket covers; production rate, over 600 units per hour. Features include continuous chain conveyor which carries 12 fixtures moving intermittently by means of air cylinder. Positive location is obtained by air-operated stop pin.

When fixture enters welding station, an air-operated clamping cylinder exerts force downward on part, pushing fixture onto locating pins and valve cover over backups. Twelve spot welds are made simultaneously.

Multi-Hydromatic Welding & Mfg Co, 23171 Grossbeck Highway, East Detroit, Mich



MILLING AND CENTERING MACHINE (Sunstrand No. 0) handles work from ¾ to 3½ in. in dia and 5 to 48 in. long. After shaft is clamped, rocker-type milling head mills one end which is then manually centered with a ¾-in. center drill. Part is reversed and located, from center or end previously machined, for milling and centering opposite end. Power feed to center drill and power clamping can be provided — *Sunstrand Machine Tool Co, Rockford, Ill*

... INCLUDING

Furnace provides automatic control of temperature and atmosphere throughout heating and quenching cycles ..... page 182

Profile milling machine features coordinated tri-directional feed system to mill any profile without feed slow-up ..... page 184

Hydraulic cylindrical grinders in five sizes have swing from 16 to 32 in. and center distances from 40 to 160 in. ..... page 186

Precision bench drills with capacities of ¼, ⅜, and ½ in. have eight speeds to max of 18,000, 9000, and 5000 rpm ..... page 186

Air gage connected to cartridge mounted on infeed slide of machine gages metal removal to "tenths" ..... page 188

Lathe cuts 40 US standard, 40 metric, and 40 worm threads without changing pickoff gears page 188

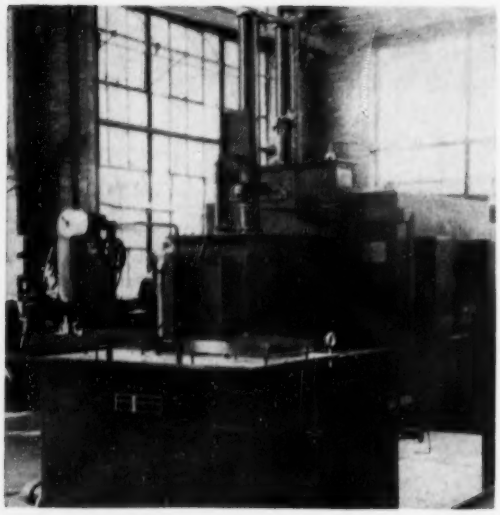
12-in. lathe offers choice between standard double V-belt drive and variable-speed transmission page 190

Valve timer operates 12 single-acting or 6 double-acting cylinders in any sequence with required cycle-time setup ..... page 192

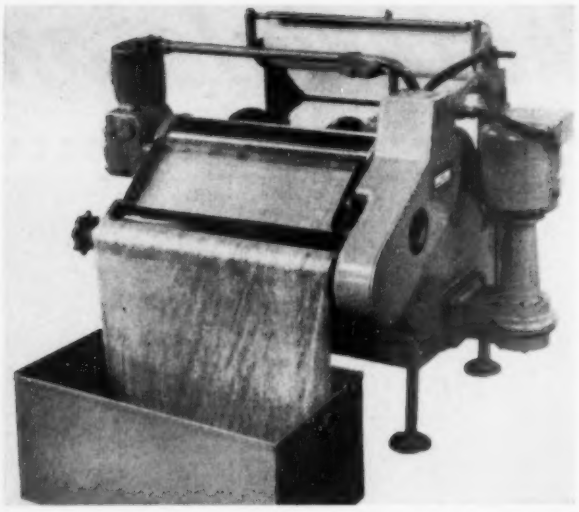
... and in Dec 7

Centerless grinding machine handles work from 1/16 to 3 in. in dia by straight-through or plunge-cut method.

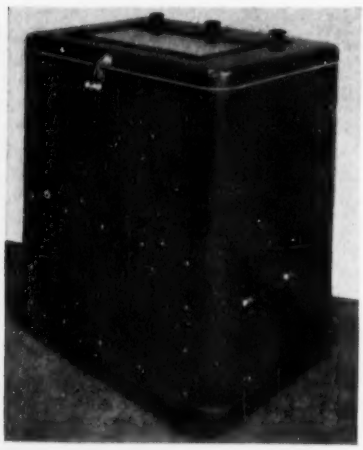
Multiple surface plate consists of two or more plates on single stand providing means of aligning plates.



FORCED-CONVECTION FURNACE provides automatic control of temperature and atmosphere throughout both heating and quenching cycles. Equipment consists of: horizontal Homocarb furnace; Microcarb atmosphere control; and L&N temperature control. Furnace combines heating chamber, quench tank, and atmosphere vestibule. Microcarb measures and controls carbon content. Range is from 1500 to 1750 F *— Leeds & Northrup Co, 4908 Stenton Ave, Philadelphia 44, Pa*



COMBINATION FABRIC AND MAGNETIC filters manufactured by Barnes Drill Co allow contaminated coolant from metalworking machines to flow directly into flow channel around magnetic drum. Coolant then passes through positive filtering fabric of specific porosity. Fabric roll is fed into filtering area automatically as required. Three models have capacities, with water-soluble oil coolant and most commonly used fabric, of 15, 30, and 60 gpm. Large model can be supplied without magnetic drum—*Barnes Drill Co, Rockford, Ill*



Cold Test Chamber In Various Sizes

Sub-Zero Products low-temperature chilling machine is available in sizes from 1.5 to 4 cu ft with temperature range from –10 to –120F. Large chilling capacity is provided within floor space of 7.5 sq ft.

To provide for close control of temperature throughout the chilling chamber, circulators are available. When required, lid can be equipped with frost-proof observation window. Interior illumination is provided if window is installed. Entrance ports in lid are also available.

Instrumentation is provided as needed with either indicating or recording thermometers. Temperature control is adjustable from +25 to –120 F. Control knob is located inside instrument cabinet.

Chilling chamber has heavy-gage steel walls. For ease of maintenance, standard motors, controls, and components are used throughout.

Sub-Zero Products Co, Cincinnati 29, Ohio

Non-Flammable Hydraulic Fluid

Houghto-Safe is an amber-colored hydraulic fluid which can be used efficiently at 1000-psi pump pressure. Film strength tests reportedly indicate that it will carry 2½ times the load of conventional petroleum hydraulic oils of similar viscosity. High oxidation stability insures long service life. Viscosity index of the liquid is 150; fluid will not freeze and is easily pumpable at working temperatures down to 0 F.

Fluid is non-toxic and non-flammable. When tested by the Factory Mutual Engineering Division of the Associated Mutual Fire Insurance Companies, fluid was reportedly rated as "acceptable hydraulic fluid from fire hazard standpoint."

E F Houghton & Co, Philadelphia, Pa

Pencil Grinder Weighs 4 oz

Nu-Jett pencil grinder uses the principle of opposed spirals which run length of barrel and rotor. Device weighs only 4 oz, will operate on air pressure of 50 lb or more, and develops speeds up to 110,000 rpm.

Unit is said to be particularly adapted to use with carbide burs because of its high speed. Also it is claimed that abrasive wheels last three times as long at this speed.

Only moving parts are the rotor and two ball bearings. Exhaust air from the grinder comes out front end and keeps all dust constantly blown away from work.

Nu-Jett Products, 1335 Michigan N E, Grand Rapids, Mich

MAJOR AUTOMOBILE MANUFACTURER DRILLS FOR OIL . . .

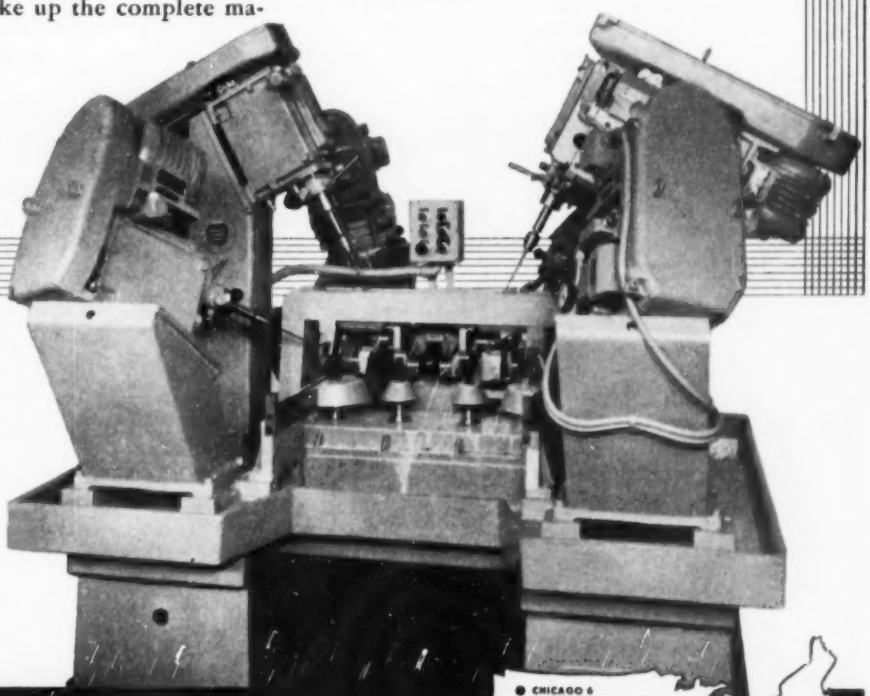
with 32 LELAND-GIFFORD Crankshaft Drilling Machines

This Leland-Gifford Drilling Machine practically takes a crankshaft out of the operator's hands, drills six perfect oil holes in it, and then hands it back.

Actually, the operator slides the crankshaft in on rails. The Leland-Gifford Machine then positions and clamps it, turns on the coolant, drills the ¼" x 5½" holes, then unclamps.

Six standard self-contained deep hole drilling units make up the complete machine. Each unit has its own feed rate, overload protection (will back out if the drill gets dull) and source of pressure. Individual units may be removed and replaced with no pipes to disconnect.

No better endorsement of Leland-Gifford Crankshaft Drilling Machines could be made than to report that the same manufacturer has just ordered additional units.

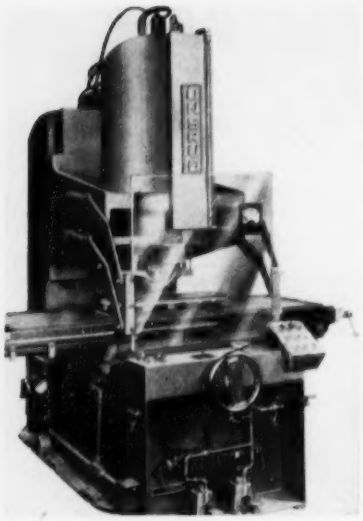


Leland-Gifford offers a complete line of modern motor spindle drilling machines plus unsurpassed engineering skill and facilities for adapting standard machines to meet special drilling needs. A Leland-Gifford field engineer can show you how to improve production and lower costs with Leland-Gifford methods.

LELAND-GIFFORD

Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A.



Faster Profile Milling With Tri-Direction Feed

Onsrud A-42 profile milling machine features a coordinated tri-directional feed system said to make possible milling to any profile without slow-up of feed. Rotary power feed of the cutter head is automatically combined with transverse and longitudinal power table feed. Coordination of feed movements is electronically maintained; feed travel is controlled by means of two hand controls.

Profiling is done from templet positioned above work; cutter head assembly includes follower. Follower and cutter are held in position by pneumatic pressure cylinder four inches long.

Machine is said to offer equally high production in straight line milling. For this table dogs may be set to control length of table travel in either longitudinal or transverse feed.

Cutter motor is rated at 15- or 30-hp at 7200 or 14,000 rpm. Distance from base of chuck to table surface is a minimum of 0.50 in. to 18.00 in. max. Maximum feed is 12 in. transversely and 42 or 60 in. longitudinally.

Onsrud Machine Works, Inc, 3921 Palmer St, Chicago 47, Ill

Pallet Dolly

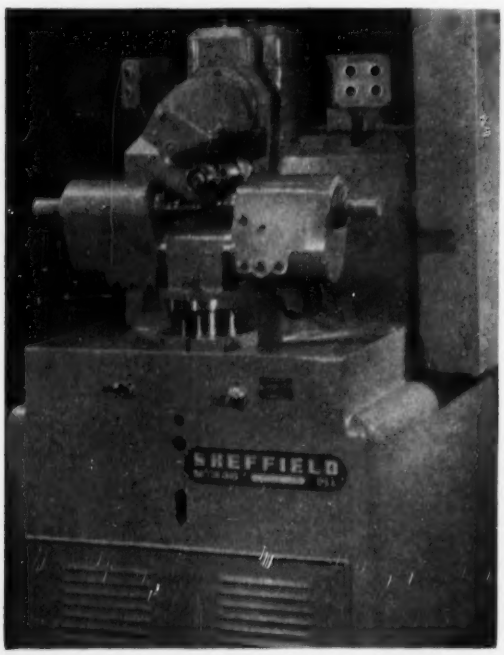
Universal pallet dolly has 24 6-in. wheels to support the load and provide surface contact. Front and rear of wheels are mounted on spring-loaded axles to assist in guiding the loaded pallet during 360° turning. Standard production sizes are 30 x 40 in. and 40 x 48 in. Larger sizes can be supplied.

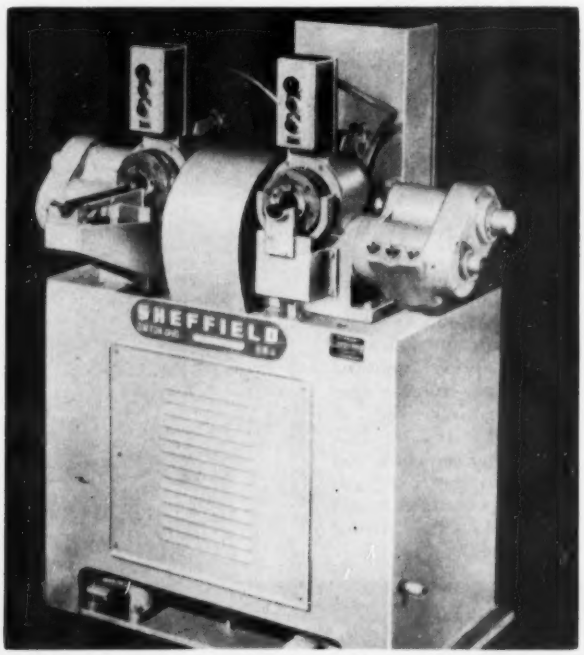
Roll Rite Corp, 801 Jefferson St, Oakland 7, Calif

Brookfield Toolholder Uses No Bushings

Latest addition to the Brookfield toolholder line is the KA Model, available with either 1- or 1½-in. shank, and capable of holding any shaped tool or toolbit from ⅛ to 1 in. Tool shank is inserted in V-jaw section of holder and jaw screws are tightened; dead center adjustment is secured by floating the clamped tool into position. The spherical undersides of the heads of these body screws, and internally beveled washers, provide a balanced pressure locking assembly. Precision grinding of all working surfaces insures that toolholder shank and V-jaw section are permanently parallel within 0.0005 in. in 6 in. according to the maker. Runout is reportedly less than 0.0001 in. per inch.

Brookfield Inc, 172 Newbury St, Boston 16, Mass





GEAR BURRING AND CHAMFERING MACHINES in the series 370 (left) and 350 (right) class use a fly-tool to remove the burr and put a slight chamfer on the ends of gear teeth. Machines are primarily used for spur or helical gears (up to 4 in. for 370 series; to 7 in. for 350 series) found in aircraft engine gearcases. Series 370 machines have one cutter spindle per head for cases not requiring the chamfering of both ends of the tooth simultaneously. They operate at same production rate as the 50 series (300 teeth per minute), but have more versatility. The 350 series machines use two cutterheads with one workhead—*The Sheffield Corp, Dayton 1, Ohio*

FYI
FOR YOUR INFORMATION

FREE Catalogs, Booklets, Charts, Calculators

FYI—these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 **PRESSES**—*V & O Press Co, Die Eenhart Mfg Co, Hudson, NY.* 12-page illustrated booklet on long slide, inclinable units covers construction features, replacement parts, specifications, and diagramatic dimensions.

2 **MILLER**—*Pratt & Whitney, Dia, Niles-Bement-Pond Co, West Hartford 1, Conn.* 12-page booklet illustrates Model BG-31 automatic tracer-controlled Keller machine for reproducing shape of any 2-dimensional template, or 3-dimensional full model. Features of single and 2-spindle units described, specifications provided.

3 **GEAR SHAVER**—*National Broach & Machine Co, Detroit 19, Mich.* 12-page folder illustrates and describes redesigned Red Ring Model GCU with automatic differential up-feed, conventional shaving and crowning, as well as diagonal.

4 **AUTOMATIC SCREW MACHINES**—*Cleveland Automatic Machine Co, Cincinnati 12, Ohio.* 7-page bulletin offers detailed information on single spindle automation, 4½- and 5¾-in. Model AB, with electric feed drive, and 4¼-in. Model AW, with mechanical feed drive. Design, construction features, specifications included.

5 **BURRING & CHAMFERING MACHINES**—*Modern Industrial Engineering Co, Detroit 1, Mich.* 4-page bulletin 104-66 covers Universal Burr-Master for chamfering entire tooth form of both spur and helical gears, as well as internal straight and involute form splines. Advantages illustrated, and production features outlined.

6 **JIG GRINDING ATTACHMENT**—*Valeron Tool Co, Dayton 10, Ohio.* 12-page booklet illustrates Valeronaire for use on variety of machines. Includes operating instructions, parts list, summaries, spindle adapters, dimensional data.

7 **SPECIAL MACHINERY & TOOLING**—*Kearney & Trecker Corp, Milwaukee 14, Wis.* 12-page booklet illustrates facilities for designing and building special equipment, and engineering service for solution of production metalworking problems.

8 **ATTACHMENTS & ACCESSORIES**—*South Bend Lathe, South Bend 22, Ind.* Illustrated catalog 5321C lists 165 items. Full information, ordering data, and prices provided.

9 **END WHEEL PRESSES**—*S W Bliss Co, Canton, Ohio.* 7-page illustrated catalog 4-A describes units of all types. Specifications for standard, medium, and deep throat presses of fixed and eccentric bed designs included.

TOOLS AND ACCESSORIES

10 **TESTING INSTRUMENTS**—*General Electric Co, Schenectady 5, NY.* 12-page illustrated bulletin GEA-6469E provides application data, features, and prices on hook-on volt ammeters, volt-ohmers, portable recorders, surface roughness scales, and others.

11 **GRINDING CEMENTED CARBIDES**—*Carborundum Co, Niagara Falls, NY.* 20-page booklet presents new techniques and alternative products, covers advantages and limitations of green grit and diamond wheels.

12 **CUTOFF WHEELS**—*Norton Co, Worcester 6, Mass.* 24-page revised manual covers various machines, selection, application and usage of wheels; typical operation illustrated; conversion tables included.

13 **JIG & FIXTURE COMPONENTS**—*Jergens Tool Specialty Co, Cleveland, Ohio.* Folder illustrates and describes expanded line of 500 items.

14 **CARBIDE TOOLS**—*Chicago-Latrobe, Chicago 10, Ill.* 24-page illustrated catalog has complete data and specifications on 40 different tools. Engineering information and carbide grades chart included.

15 **FACE MILLING CUTTER & SHELL END MILL**—*Motch & Merryweather Machinery Co, Cleveland 12, Ohio.* 7-page bulletin illustrates Kraslok units for general purpose and heavy-duty cutting of any machinable material. Includes technical data and specifications.

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17 CARBIDE TOOLS—*Super Tool Co, Detroit 15, Mich.* 92-page plastic-bound illustrated catalog gives detailed data on standard line, miscellaneous carbide tipped, solid carbide, ejector, and special tools. Includes specifications and prices.

HEAT-TREATING AND WELDING

18 HARDFACING—*Air Reduction Sales Co Div, Air Reduction Co, New York 17, NY.* 12-page Welding Journal reprint, "Selection & Evaluation of Methods of Hardfacing," discusses methods, particularly inert-gas-shielded arc process.

19 ALUMINUM HEAT-TREAT FURNACE—*James H Knapp Co, Los Angeles 31, Calif.* 8-page brochure on Knapp-Lee quick quench unit featuring arrested descent of material from furnace to quench in up to 6 seconds, depending on type of material.

20 ROD SELECTOR CHART — *Eutectic Welding Alloys Corp, Flushing 58, NY.* 22x34-in. wall chart lists 160 different low temp welding alloys, bonding points, tensile strengths, etc. Includes description of main uses for each rod and electrode.

21 FURNACE & INDUCTION BRAZING—*General Electric Co, Schenectady 5, NY.* 12-page booklet GEA-5889 presents illustrated case histories indicating greater economy achieved than with former processes.

PLANT SERVICE EQUIPMENT

22 PLANT-LAYOUT — *Repro-Templets Inc, Oakmont, Pa.* 55-page catalog describes system, lists all machine tools, materials-handling equipment, etc, grid sheets and accessory material available for use. Two-dimensional templets are on adhesive-backed film.

23 BLAST CLEANING — *Pangborn Corp, Hagerstown, Md.* 28-page illustrated booklet gives comprehensive information; advantages, uses, machines, abrasives, applications, and glossary of terms.

24 FLOORS—*Tremco Mfg Co, Cleveland, Ohio.* 24-page illustrated brochure discusses types, construction, deterioration, special problems and maintenance.

25 ULTRASONIC CLEANING—*General Electric Co, Schenectady, NY.* 4-page bulletin GEA-6056 describes generator, principles of high-frequency sound cleaning, applications. Equipment illustrated.

26 BARREL FINISHING—*Lord Chemical Corp, York 3, Pa.* 32-page handbook and catalog describes Lubro compounds for wide variety of finishing operations. Application index provided.

27 SIGNAL GUIDE BOOK—*Benjamin Electric Mfg Co, Des Plaines, Ill.* Manual and catalog is complete reference book. Contains glossary, selection guide, specifications and listing of equipment, applications. Includes automatic signals for machinery and industrial cycling.

28 VAPOR DEGREASING — *Circo Equipment Co, Clark (Rahway), NJ.* 24-page manual contains detailed information on processes, equipment, operation, maintenance. Solvents and recovery stills discussed.

29 STEEL EQUIPMENT — *Stacor Equipment Co, Brooklyn 8, NY.* 31-page catalog illustrates complete line of industrial furniture. Contains sketches of suggested working arrangements, and detailed design features.

30 MATERIALS HANDLING—*Lewis-Shepard, Watertown, Mass.* 12-page October issue of Lever, company journal, presents twelve handling problems and actual solutions in various plants.

PARTS AND MATERIALS

31 STAINLESS STEEL TUBING—*J Bishop & Co Platinum Works, Malvern, Pa.* 8-page illustrated bulletin on cold drawn mechanical, capillary, hypodermic, and other tubing from 0.005 to 1-in. OD; nickel and nickel alloy, and small tubular specialties. Analysis, specifications, tolerance tables, properties included.

32 ELECTROLYTIC IRON POWDER PARTS—*Plastic Metals Div, National Radiator Co, Johnstown, Pa.* 28-page booklet presents production facts on fabrication of mechanical parts, said to be capable of higher strength than sheet or bar stock, and adherence to closer dimensional tolerances.

33 STAINLESS STEEL FASTENINGS —*Star Stainless Screw Co, Paterson 3, NJ.* 20-page catalog 53-B itemizes varied line. Contains page of ordering short cuts, chart explaining AN specifications, and decimal equivalent chart.

34 PROVING RINGS—*Morehouse Machine Co, York, Pa.* 21-page bulletin describes and illustrates rings and their use in the calibration of materials testing machines.

35 RIGHT ANGLE GEAR SPEED REDUCERS—*D O James Gear Mfg Co, Chicago 7, Ill.* 84-page illustrated catalog 42-B provides extensive information. Parallel and vertical drives, with ratios from 1:1 to 100:1 and rating from 0.14 to 350 hp; specifications and recommended practice included.

36 TUNGSTEN CARBIDE COMPONENTS—*Sintercast Corp of America, Yonkers 2, NY.* 11-page booklet on Sinterforge line. Pieces ranging from ⅛ gram to 18 lb illustrate variety of shapes, sizes, and forms available.

37 LATCHES—*Simmonds Aerocessories, Inc, Tarrytown, NY.* Design portfolio containing full-scale drawings and data sheets on 18 different models of heavy-duty structural line.

38 V-LINK BELTING—*Drummer Corp, New York 13, NY.* Data book B220 gives complete engineering and application data. Includes illustrations and charts.

MISCELLANEOUS

39 TRAINING METHODS FOR METALWORKING — *National Machine Tool Builders' Association, Cleveland, Ohio.* 32-page booklet, "Key to Survival and Growth," reviews training programs for learner, apprentice, and graduate engineer currently in effect, with emphasis on inaugurating the learner program.

40 STANDARDS—*American Standards Association, New York 17, NY.* 24-page revised booklet "Standards Are Your Business" defines standards of production, gives objectives of the voluntary movement, includes examples of recent savings through standardization in leading corporations.

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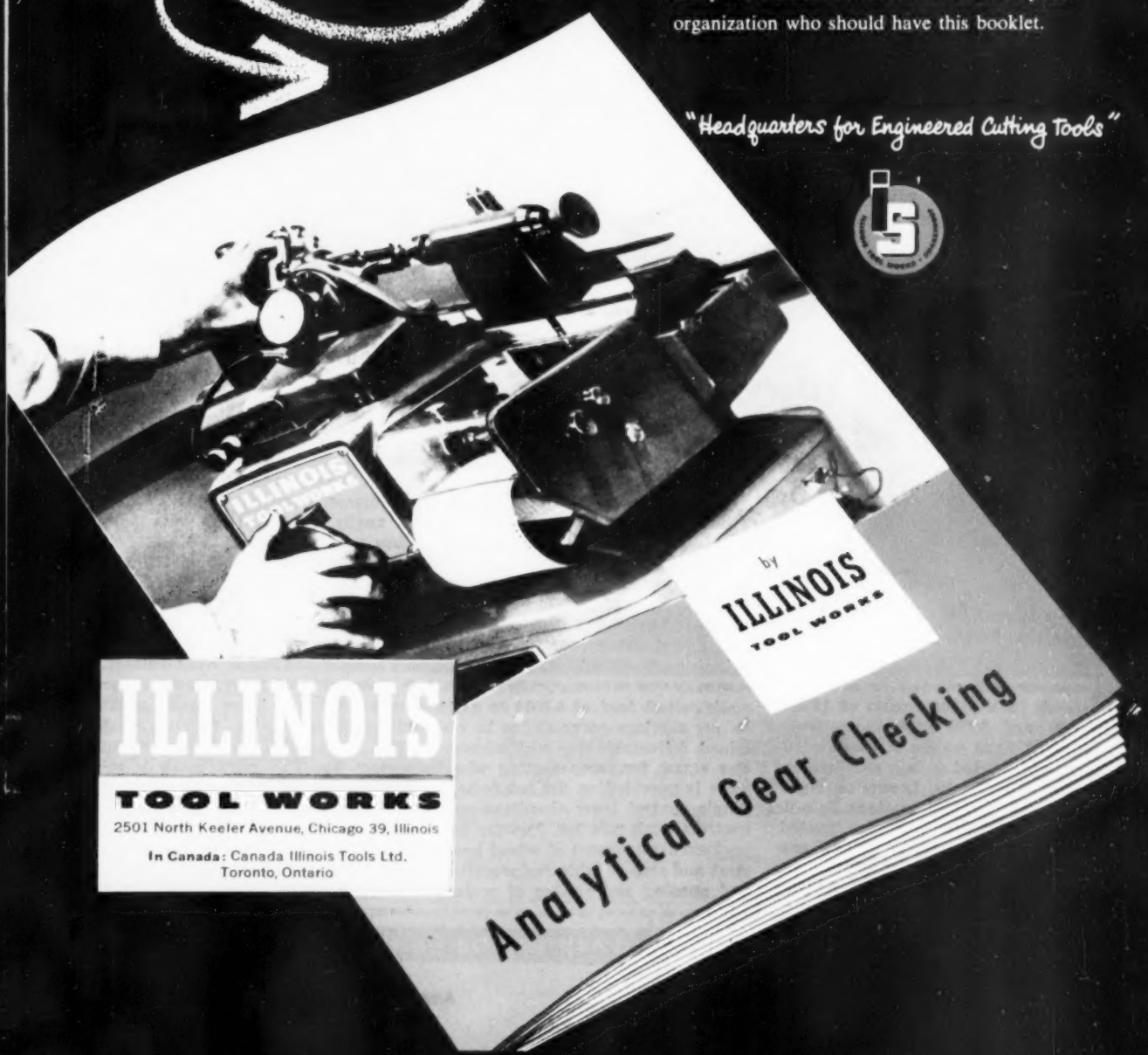
"Headquarters for Engineered Cutting Tools"

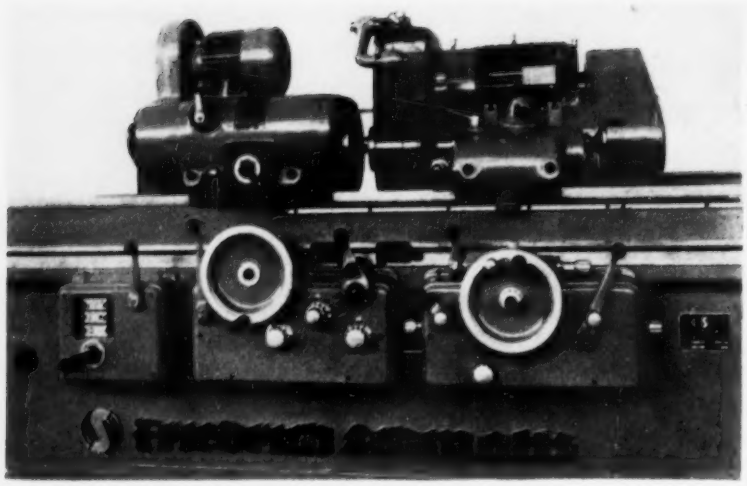


ILLINOIS

TOOL WORKS

2501 North Keeler Avenue, Chicago 39, Illinois

In Canada: Canada Illinois Tools Ltd.
Toronto, Ontario



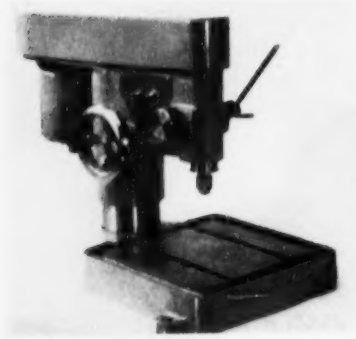
German Hydraulic Cylindrical Grinders

Schmaltz grinders are available in five sizes from 16- to 32-in. swing, with center distances from 40 to 160 in. Box-shaped bed has bellow-protected bedways and is reinforced for maximum rigidity. Table top is of triangular cross-section for best absorption of grinding pressure and weight of work. Top can be swiveled for grinding slender tapers, the amount of taper being set by graduated scale and vernier. Work carriage can be traversed either manually or hydraulically with infinitely variable table speeds up to 12 fpm. Hydraulic system is properly insulated to prevent pump vibration and oil temperature rise from affecting the operating accuracy. Table ways are pressure-lubricated with filtered oil.

Carriage reversal is effected either by hand lever or automatically by means of movable reversing dogs with micrometer adjustment. Dial equipped mechanism controls amount of carriage dwell at one or both ends of carriage travel. Workhead is arranged for both dead-center and live-center operation. Tailstock has spring-loaded barrel which can be locked in retracted position.

Wheelhead base moves on a V and flat way; nitrided spindle runs in adjustable bearings. Axial spindle thrust is absorbed by ball bearings. Grinding-wheel feed is effected either manually or automatically; automatic wheel feed of 0.0001 to 0.001 in. per carriage reversal can be obtained. Adjustable stop with micrometer screw for compensating wheel wear is provided on the handwheel. Single control lever simultaneously controls work rotation, forward and backward movement of wheel head, start and stop of table reciprocation, and opening and closing of coolant valve.

Imported by Parker Machine Co, Inc, 158 Pioneer St, Brooklyn 31, NY



Eight Speeds for Precision Bench Drills

Precision bench drills (French) have capacity of ¼, ⅜ and ½ in. with 8 speeds each to maximum of 18,000, 9,000 and 5,000 rpm respectively. Drilling head weight is counter-balanced by loaded springs and head rotates left or right. Levers on right-hand side lock both motions. Spindle down movement is spring loaded, with pressure adjustable and precision stop provided. Built-in light illuminates work area. Weight of ⅜-in.-capacity drill is 196 lb.

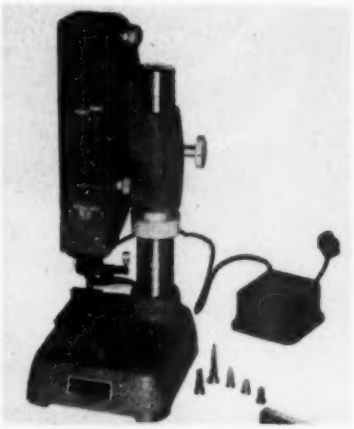
Imported by Fasma, Inc, 2 Park Ave, New York 16, NY

Shear-Seal Valve For 1500-psi Oil Service

Shear-Seal principle, formerly applied to 3000- and 6000-psi valves, is now available in 1500-psi series for oil service. Valves feature leak-proof closure, high-flow capacity, low handle load, no freeze-ups, excellent throttling, no wire-drawing, and non-critical reaction to dirt.

Straight porting of 4-way series provides for manifolding with standard tees in the pressure and return ports. Position stops and detents are fully enclosed. Valves range from ¼- to 1-in. pipe size.

Barksdale Valves, 5125 Alcoa Ave, Los Angeles 58, Calif



German Amplifying Gage

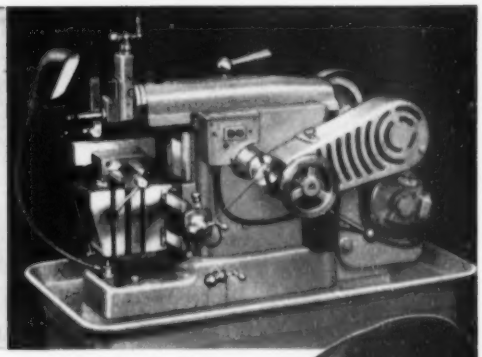
Instrument combines optical and mechanical principles and is set up with a master; pieces are passed under the contact tip to show variations, on a screen, against an illuminated background. Oversized parts are shown as green and undersize as red. The diameter capacity is 6 in. Variety of anvils, contact tips, and backstops are available.

The dial is graduated in 0.00005-in. divisions and has a range of 0.005 in. With one single gage block any size varying by half "tenths" to ±0.00025 in. may be set up, eliminating complicated master combinations. A beam of light from a low-voltage lamp projects an index mark against tilting mirror with fulcrum that gives 4:1 initial magnification to contact tip. The index mark is reflected against a first surface mirror that redirects the beam of light and the index mark against a long translucent screen which results in total amplification on the scale of 1000:1. The instrument, termed the Opti-Comparitol, is made by E Leitz.

Imported by George Scherr Co, 200 Lafayette St, New York 12, NY

South Bend 7" Shaper

FAST • EFFICIENT • ECONOMICAL!



Watch your machining costs on small work go down when a South Bend 7" Shaper takes over.

FIRST, its speed — 42 to 195 strokes per minute reduces machining time.

SECOND, its 7" stroke will handle a good share of your small toolroom, maintenance and production jobs thus releasing your heavy shapers for larger work. This stops the waste of using excess machine capacity on small jobs.

THIRD, with its small initial cost, less power consumption and low upkeep expense, your equipment budget won't take a beating when you specify South Bend 7" Shapers. Find out how these fast, versatile shapers can save you money. Call your local South Bend distributor today or send the coupon for complete information.

SPECIFICATIONS

RAM

- Stroke length . . . . . 0 to 7"
- Strokes per min. (4) . . . 42 to 195
- Cutting speeds . . . 3 to 114 feet per minute

TOOL HEAD

- Vertical travel . . . . . 3"
- Tool post slot . . . . . 3/8" x 7/8"
- Head swivels . . . . . 360°
- Clapper swivels . . . . . 35°

TABLE

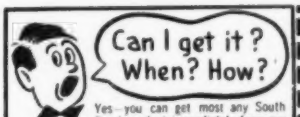
- Vertical travel . . . . . 5"
- Horizontal travel . . . . . 9½"
- Power cross feeds (6) . . . . . .002" to .012" (reversible)
- Size . . . . . 6 5/16" x 5" x 5 3/8"
- Distance from ram . . . ½" to 5½"

VISE

- Maximum opening . . . . . 4"
- Jaw width . . . . . 4"
- Jaw depth . . . . . 1"
- Height over table . . . . . 2 11/16"

MOTOR

- ⅓ or ½ h.p.



Yes—you can get most any South Bend product immediately from our distributor's stocks in principal cities. Items not stocked, shipped promptly from factory.

Three ways to order:

1. See or telephone nearest distributor.
2. Order by mail from your distributor.
3. If no distributor is nearby, order direct from factory.

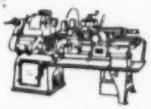
South Bend machine tools with accessories may be purchased on convenient terms up to 12 months.

PLEASE SEND INFORMATION CHECKED:

☐ 9" and 10" BENCH LATHES

☐ 10" to 16-24" FLOOR LATHES

☐ DRILL PRESSES



☐ ½" & 1" Collet TURRET LATHES

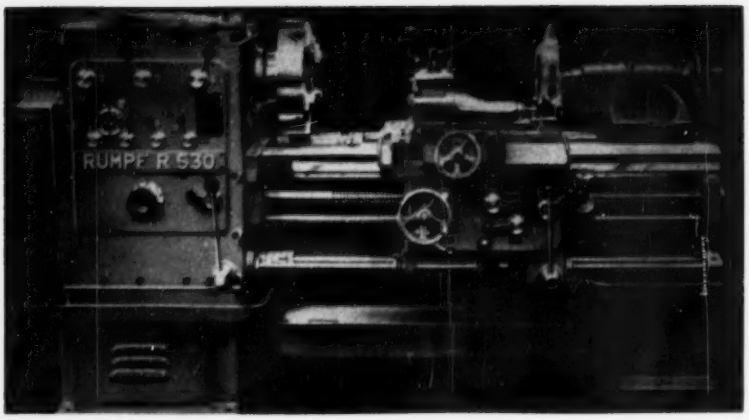
☐ TOOL GRINDERS

☐ 7" BENCH SHAPERS

Name _____ Company _____

Street _____ City & State _____

Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana



Belgian Production Lathes Built to American Standards

Two Progress geared-head precision engine lathes have been introduced. Illustrated Model is Type R-530 with 17-in. swing and center distances ranging from 39 to 118 in. Type N is available with 16, 20, 24 and 28-in. swing with center distances from 39 to 197 inches. Type R lathes have 18 spindle speeds ranging from 15 to 1500 rpm.

Machines are arranged for direct multiple V-belt motor drive; start, stop and reverse of spindle are operated by multiple disk friction clutches. Lathes are provided with quick-change gear boxes for cutting 40 different US standard threads, 40 metric threads, 40 DP worm threads, and 40 metric module worm threads without change of pick-off gears. Lead screws have ½-in. thread pitch; feed dials read in 0.001-in. divisions.

Type N all-geared headstocks provide for 12 spindle speeds; 16- and 20-in. lathes have US standard long-taper key drive spindle noses; 24- and 28-in. lathes have threaded spindle noses for mounting chucks with threaded back plates.

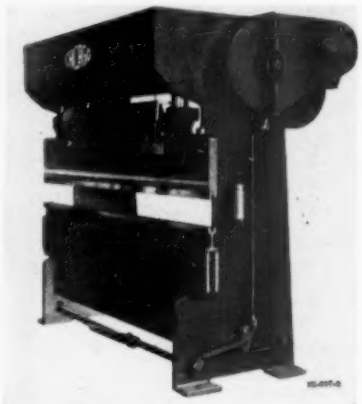
Imported by The Parker Machine Co, Inc, 158 Pioneer St, Brooklyn 31, NY

Sheffield Setup Gages Metal Removal To "Tenths"

Plunjet gaging cartridge connected to a column-type air gage, such as Precisionaire, is mounted on the infeed slide to indicate against a fixed adjustable stop attached to the stationary part of the machine. Movement of the infeed slide is transmitted to the Precisionaire where it is amplified and indicated by position of float in gage.

When Plunjet is connected to a Precisionaire having an amplification of 5000 to 1, a movement of only 0.0001 in. of the infeed slide causes the float to move a half inch in the column. Plunjet and float position are set up on a part that is within tolerance. Then each successive part is machined until float is in line with preset pointer on gage.

The Sheffield Corp, Dayton 1, Ohio



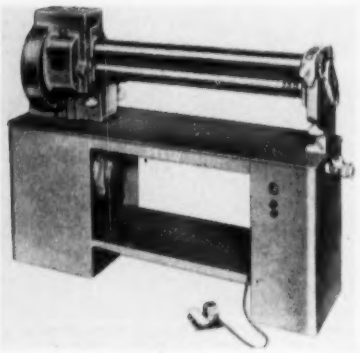
Chicago Press Brake Has 3-in. Stroke

Series A model press brake is said to offer increased production, because of its variable-speed drive and other features, for a machine of its size. Twin-plate bed provides lateral rigidity, minimum deflection, and 1¼-in. slug clearance on multiple punching. Variable-speed drive (infinitely variable from 20 to 50 sfpm) permits selection of ideal speed for the job.

Even application of power over length of ram is obtained by twin drive through double-back gear. Friction clutch and band brake permit jogging and slipping. Ram adjustment is motorized.

Machine is available in three sizes with capacities of 54 in. by 10 gage to 120 in. by 16 gage. Each size has 3-in. stroke, 3-in. ram adjustment and 12-in. die space.

Dreis & Krump Manufacturing Co, 7500 S Loomis Blvd, Chicago 36, Ill



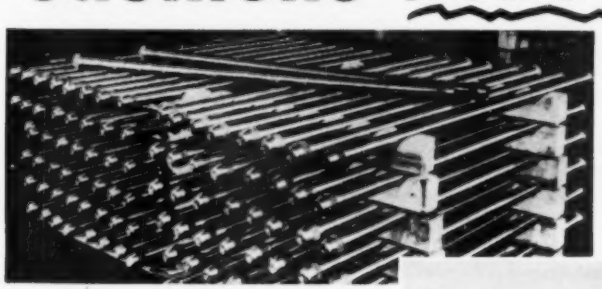
Pexto Powered Forming And Shearing Machines

Pexto 3-in. power rolling machine handles rolls from 36 to 48 in. in length and with 3-in. diameter. Models are available with capacity in mild steel from 14 to 16 gage and from 16 to 18 gage; speed of rolls is 45 rpm. Magnetic starter is provided and drive is from geared-head motor through V-belts. Powered third roll picks up stock from pinch rolls; rear roll is grooved for easy start. Rear roll position indicators are provided for accurate duplication of work. Forward-reverse foot switch is provided for safe, instant control. Switch can be set for continuous or momentary contact.

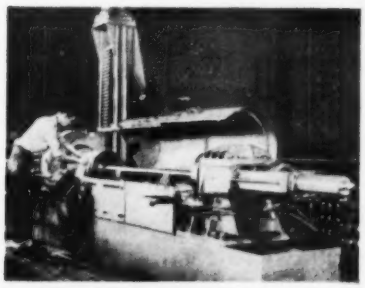
Power squaring shears handle stainless steel of 16- or 18-gage and have a cutting length of 48 or 72 in. Strokes per min. on both machines is 62. Design is said to utilize maximum cutting life of each of four edges of knives. Close setting at cutting edges is held while proper face clearance between upper and lower is developed as shear stroke progresses past point of cut. Hold-down beam serves as fixed tie brace and can be removed for blade setting. Gage brackets travel in hand-scraped ways for accurate alignment. Pointer indicates the nearest ⅛ in. and handwheel is graduated in 1/128-in. divisions. Extra equipment includes front-operated back gage.

The Peck, Stow & Wilcox Co, Southington, Conn

U·S·S Carilloy steel cushions bone-rattling jolts on the world's finest medium tank



Here are the Carilloy steel torsion bars ready for shipment. Torsion bars are used on the Patton 48, and others, so that the tanks can be built closer to the ground, giving a lower silhouette.



On this twister at the Cicero plant of Maremont Automotive Products, Inc., the finished Carilloy steel torsion bars are prestressed before shipment to the tank manufacturer.

THE army's amazing new Patton 48 not only moves faster, shoots straighter, and offers better protection to the tank crew than World War II models, but it has a vastly improved suspension system that features torsion bar springs made of U·S·S CARILLOY steel. As a result, it rides lower, more level, and with less jarring.

During rugged field tests, this 45-50-ton tank rolls along at more than 30 miles an hour, knocks down telephone poles and houses, rumbles over deep trenches and scales 3-foot walls. All the while, the CARILLOY steel torsion bars that support the driving wheels flex, twist, and vibrate. They smoothly absorb most of the jolts.

Torsion bars withstand this heavy pounding . . . and do a better job of cushioning these shocks than previous spring systems. What's more they take less space, so the tank can be built closer to the ground and has a lower silhouette.

U·S·S CARILLOY 8660 is a Ni-Cr-Mo electric furnace steel which possesses the hardenability needed in these torsion bars. It will produce a minimum hardness of 55 Rockwell "C" at $\frac{9}{16}$" from the quenched end in the standard End Quench hardenability test. It has exceptionally good surface and sub-surface qualities.

Both the U.S. Army Ordnance Corps and the spring manufacturer, Maremont Automotive Products, Inc., are well satisfied with this excellent performance.

U·S·S CARILLOY steels are doing many tough jobs like this on both military and civilian products. No matter what steel problem you have, we have probably met and licked one like it before. We can help you solve yours. Just contact our nearest District Office, or write to United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Carilloy Steels

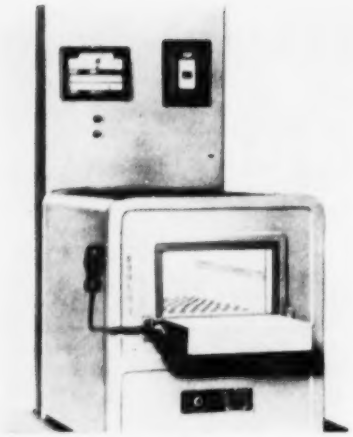
USS

ELECTRIC FURNACE OR OPEN HEARTH

COMPLETE PRODUCTION FACILITIES IN CHICAGO OR PITTSBURGH

3-1814-A

UNITED STATES STEEL

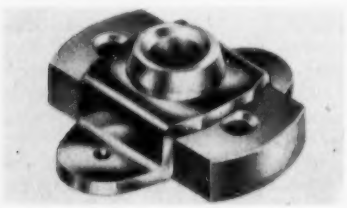


Circulating Draw Furnace Features Close Control

Cooley recirculating-air draw furnaces are said to be useful in the tempering of steel and other operations requiring precise low-temperature control with particular emphasis on uniform heat-treating. Models available have chamber sizes of 8 x 6 x 14 in., and 12 x 8 x 18 in.

Stainless steel retort houses the entire interior and side wall baffles are provided. A fan is located below the perforated hearth driven through a V-belt by motor located at rear of furnace. Furnace atmosphere is directed outward to baffled side sections, upward behind these baffles, at which point the elements are located, over the top and into the chamber. It continues downward, being forced through the work and returning to the fan. Baffle walls prevent direct radiation from the elements to the work surface.

Cooley Electric Mfg Corp, 38 South Shelby St, Indianapolis 7, Ind



Anchor Bushings

Nut plate anchor bushings for use on drill templets provide means of locating and drilling three coordinated screw and rivet attachment holes for nut plates. Cross type is used where edge distance is not critical. End type features a minimum edge distance location. Screw sizes are No. 6, No. 8, No. 10, ¼, 5/16 and ⅜ in.

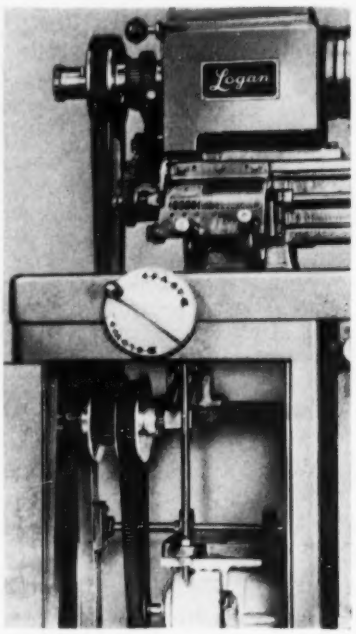
The Hi-Shear Rivet Tool Co, 8924 Bellanca Ave, Los Angeles 45, Calif

Carbide Tool Grinder Finishes Edges With Abrasive Belt

Vari-Tool abrasive belt finisher has been designed to produce the finest available edge on carbide tools. Unit is available as a complete pedestal model with a 6-in. cup grinding wheel on left-hand side, with accurate tilting table. The 4x54-in. abrasive belt assembly on right-hand side includes a precision tilting table.

Model is also available without the cup-wheel-table assembly, or as a separate unit for utilizing present existing motorized units—either a motor drive or a bench grinder.

Standard Electrical Tool Co, Cincinnati 4, Ohio



Choice of Transmission On Logan 12-In. Lathe

Logan 12-in. lathe offers choice between standard double V-belt drive and variable-speed transmission. The variable-speed drive permits a wider spindle-speed range than the standard V-belt drive, with an infinite choice of speeds between the high and low. In back gear the speed range is 38 to 295 rpm; direct-drive range is 250 to 1575 rpm. Variable-speed drive can be set while the lathe is running. Twelve complete turns of the handle change speed from lowest to highest rpm. Brass spindle-speed chart mounted on gear guard provides clearly marked settings for various speeds. Power is transmitted by 38- and a 60-in. oilproof, heat-resisting, Vari-speed belt.

Logan Engineering Co, Sales Div, 4901 West Florence Ave, Chicago, Ill

Vandersee Metallizing Machine Eliminates Manual Adjustments

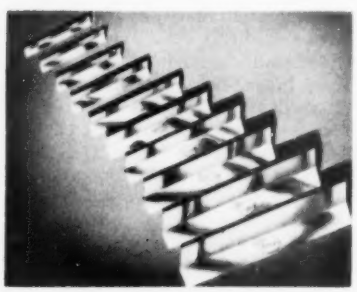
Metallizing machine was designed to be compact, light-weight, and easy to operate. All bearings for the wire-feed mechanism are encased in the main body gear-case casting. Gas mixing chamber is built into nozzle at point of combustion to eliminate backfire. Machine is said to assure an even flow of metal to the surface being metallized.

Vandersee Engineering Co, Inc, 727 W 7th St, Los Angeles, Calif

Sander-Polisher Attachment Fits ¼-in. Electric Drill

Sander-polisher attachment is said to fit any make of ¼-in. electric drill. Unit operates at double the rpm speed of the drill and employs orbital motion for perfect finishing. Working surface is 3 2/3x7 in. Price: $15.95.

Du-Fast, Inc, 32 E 4th St, New York 3, NY



HSS Tool Bits

Besley Bonus Bits are available as finished group bits in 10 sizes of squares from 3/16 to 1 in. accurately ground to 0.001 in. Made from molybdenum-tungsten alloy, bits are said to have excellent red hardness characteristics, resistance to abrasion and unusual toughness.

Besley Welles Corp, Beloit, Wis

SUNNEN HONING

SPEEDS MACHINE ASSEMBLY SIMPLIFIES FIELD MAINTENANCE

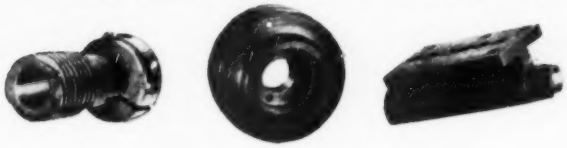
PROBLEM: Hold close hole tolerance and good surface finish on button-hole machine part, to provide perfect interchangeability for easy assembly of new machines and repair in the field.

MATERIAL: Aluminum Alloy, SAE26.
HOLE DIAMETER: 11/32″
HOLE LENGTH: 1.0″
STOCK REMOVAL: .0003″ to .0005″
FINISH: 16 Micro-inches
TOLERANCE: .3438″ to .3442″
MANUFACTURER: Reece Corp., Waltham, Mass.

SOLUTION: Sunnen Model MBB-1290 Honing Machine with Standard K10 type mandrel and honing stone, plus Sunnen Honing Oil.

RESULTS: 110 parts per hour—virtually no rejects. Sunnen Honing has proved the most practical way to manufacture these parts at a cost that is competitive. This method was so successful that Reece has designed many other parts specifically for honing.

OTHER PARTS HONED AT REECE CORP.



SUNNEN PRODUCTS COMPANY
7929 Manchester Avenue, St. Louis 17, Missouri
Canadian Factory: Chatham, Ontario

In plant after plant Sunnen Honing Machines have been the solution to production problems that could not be handled by drilling, reaming, boring, lapping, or grinding.

You'll find them economical for job lots as well as long production runs . . . for de-burring as well as micro-fitting . . . for producing holes to engineering specifications as well as for eliminating manufacturing bottlenecks.

These machines generate geometrically perfect holes with fast stock removal . . . produce a guaranteed accuracy of .0001″ or better and surface finish to 2 micro-inches RMS . . . have a diameter range of ⅛″ to 2⅝″ . . . require no jigs or fixtures . . . are used in thousands of plants in production, tool room, maintenance, salvage. Average installation costs less than $1,000.

Sunnen Honing Machines may be *your* answer, too. Investigate now.

Mail the Coupon NOW for this Free Booklet

Sunnen Products Co.
7929 Manchester Ave., St. Louis 17, Missouri

☐ Send Free Booklet on Sunnen Honing

☐ Have A Field Engineer Call, no obligation

Name.....

Company.....

Address.....

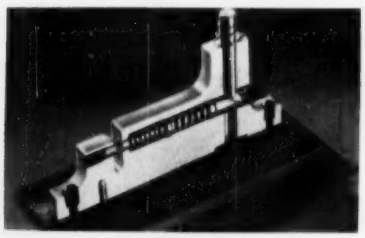
City..... Zone..... State.....

Indicating Head Swivel On Toledo Industrial Scales

New Toledo line includes a full range of models from bench scales to heavy duty motor truck scales. One-piece sectors are featured in the full-floating, double-pendulum mechanism and it is reported that this construction increases precision and strength.

Indicating heads can be installed to face in any of eight directions or scale can be ordered with head that swivels through full circle. Tare and capacity beams are stainless steel with chrome-plated brass poises. Platform areas have been increased while over-all dimensions have been reduced.

Toledo Scale Co, Telegraph Rd, Toledo 1, Ohio



Wales Punching Unit Uses Horizontal Motion

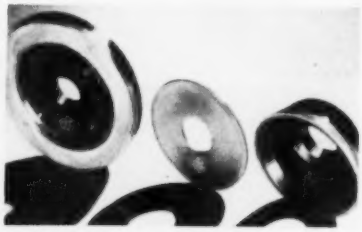
Type H horizontal hole-punching units are designed to punch holes in curved and straight flanges, rims and angles, and similar shaped and formed work. Punching holes in the side of the work is possible because the punches move back and forth horizontally. Units are said to eliminate expensive single-purpose cam-action dies.

Each unit is independent and self-contained, permitting the same group of units to be used and reused on press brake rails and on templets in stamping presses. Setups on rails or templets permit unlimited center-to-center horizontal hole-punching patterns. Punch die guide and stripping spring are held as a unit by the holder, which reportedly assures perfect alignment of punch and die.

All working parts of the units are hardened and ground steel; holders are all-steel construction. Punches and dies are said to be quickly removed for sharpening and replacing.

Units punch holes up to ½ in. in diameter in mild steel, up to ⅛ in. thick.

Wales Strippit Corp, 345 Payne Ave, North Tonawanda, NY



Alloy-Bond Diamond Wheel Claimed to Be Fastest

The manufacturer claims that the Jetaline diamond wheel gives the fastest diamond wheel cutting action on carbide that has been developed. Cutting action is said to be due to use of special-alloy metal bond which is non-glazing and non-loading, avoiding overheating and need for diamond wheel redressing. Advantages claimed are: cuts faster, deeper, freer and cooler; gives approximately seven times the life of a resinous wheel; will not heat or crack carbide when used with full flow of coolant; an all-purpose wheel which replaces resinous, vitreous or metal bond wheels; will punch-cut carbide as deep as ⅛ in. in a single pass; face will not glaze or fill up; finer meshes can be incorporated; exact finish expected is produced.

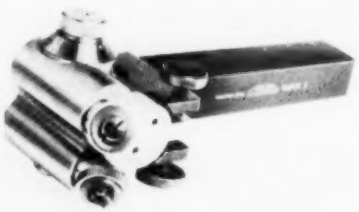
Action Diamond Tool Co, 4545 West Grand Ave, Chicago 39, Ill

ELECTROPNEUMATIC VALVE TIMER operates 12 single-acting or 6 double-acting cylinders in any desired sequence with required cycle-time setup by quick-change gears. Features: infinite adjustment of individual cams; sensitive remote-control buttons; continuous operation or single cycle with pushbutton starter — *Mead Specialties Co, Inc, 15 S Market St, Chicago 41, Ill*

Sweep Press Guard

Operating principle of this small power-and-kick press guard is based on the sweep action of an adjustable guard arm which works with the downward motion of the ram. While the press is not in operation the guard arm remains entirely out of the operator's way at the extreme left or right side of the press. As soon as peddle is pushed to operate the press, the guard arm sweeps completely beyond the press feed area on the first half of the downward stroke. Offset guard arm is designed so that it can sweep between the upper and lower dies. Installation necessitates drilling and tapping of only one hole in bottom of ram, while existing top side gib adjusting screw is used to install the steel guard head mounting bracket.

Searjeant Metal Products, Inc, 77 Pittsford Rd, Mendon, NY



Alina Knurl Cutter Actually Mills Patterns

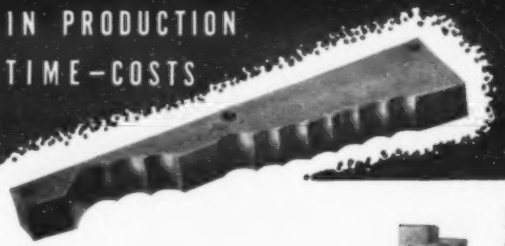
Knurl cutter produces cross, diamond, and straight knurls of various pitches on cast iron, non-ferrous metals, and plastics with diameters from 1/16 in. to 10 ft. Patterns are actually milled, chips being produced in the process. Internal knurls can also be produced.

Life of cutter wheels is said to be extremely long—they can be reconditioned by a simple face grinding and replacement cutter wheels can be quickly installed. Cutter can knurl delicate thin-walled parts without internal support.

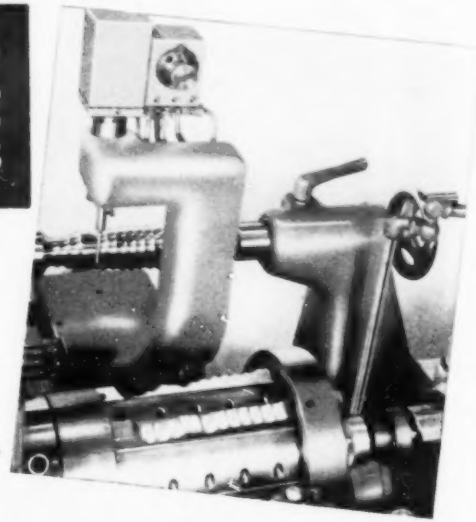
Alina Corp, 401 Broadway, New York 13, NY

SAVED!
1 HOUR AND 55 MINUTES PER PIECE

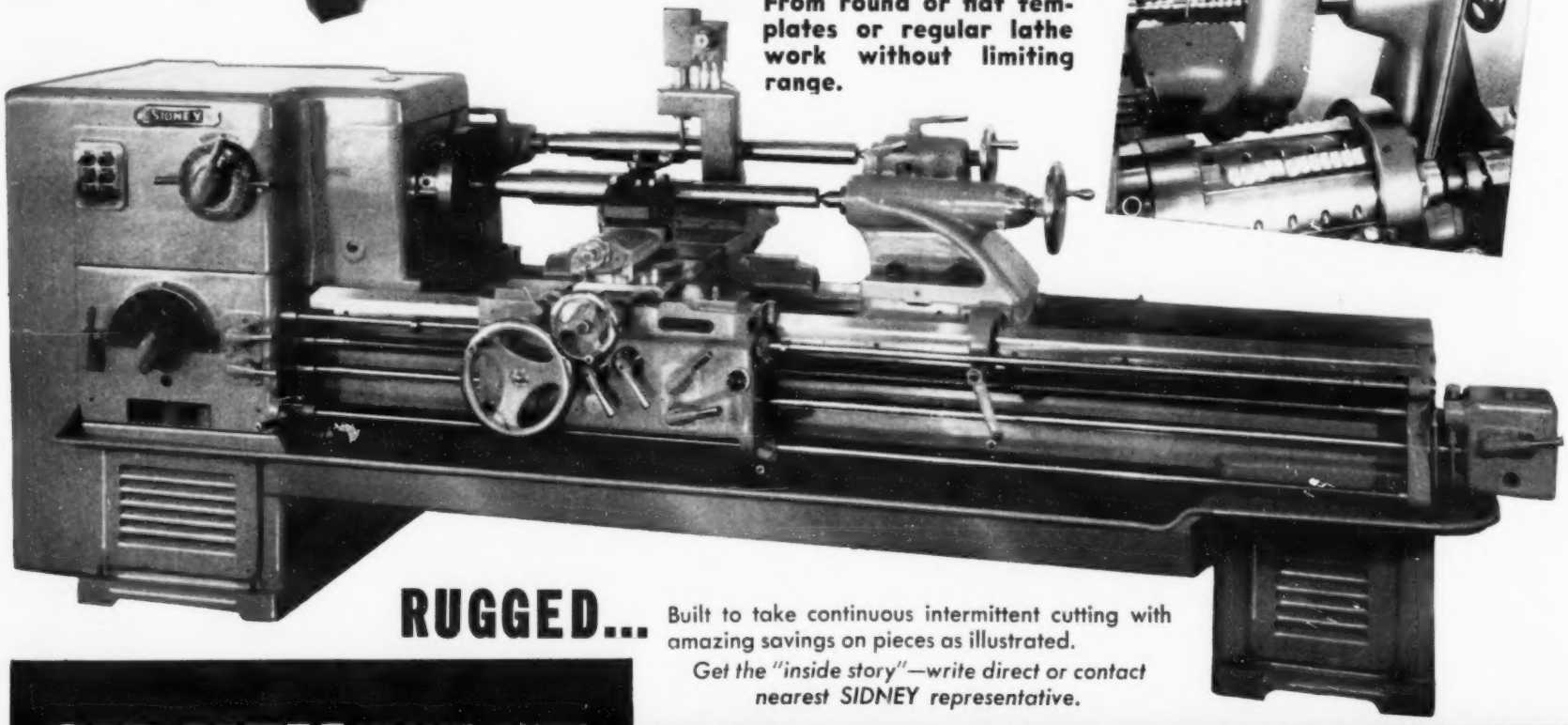
IN PRODUCTION TIME—COSTS



SIDNEY FLUID TRACER TIME ONLY 10 MINUTES



From round or flat templates or regular lathe work without limiting range.



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Tangents by Tange

LEBENSRAUM

You will recall that conquerors, since time began, have justified their conquests of neighboring weaker (and less advanced, usually) provinces or countries with the plea that they needed space in which to grow—land for their people.

Something similar is happening in industry, and the conqueror is the automobile. Employers have found that workers can be drawn, not from walking distance, or rooming distance, or even streetcar distance, but from as much as 50 miles away. They've also found that the worker with a car wants a reasonably safe place to park it while he works. Thus, any nearby land must be bought by the company, no matter at what price, and converted to parking areas—or no labor will stay. And labor itself now has motive power, so is independent of the nearby plant—sons do not work there because their fathers did, but because it is a good place to work.

There is more leisure time, too, and this suggests a house with land around it, a nearby golf course or lake, a chance to bring the kids up clear of city streets. And plants grew and grew until no ordinary worker could possibly know the top boss, nor could the boss know them or their problems. With no personal friendship, misunderstanding flowered. What's more, another form of automobile—the truck—has made some plants independent of railroads. If the product is light and non-bulky, railroad sidings are not essential.

These are some of the reasons for the trend toward single-product or division plants in non-city areas, smaller plants that tap new sources of labor, that have nothing but open fields around them and nothing but small towns near. The fancy word is decentralization, and all sorts of labor shortage, defense dispersal and other reasons can be and are given for them.

But the basic reason is the automobile. I have been in a number of such plants—have just, in fact, re-

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK

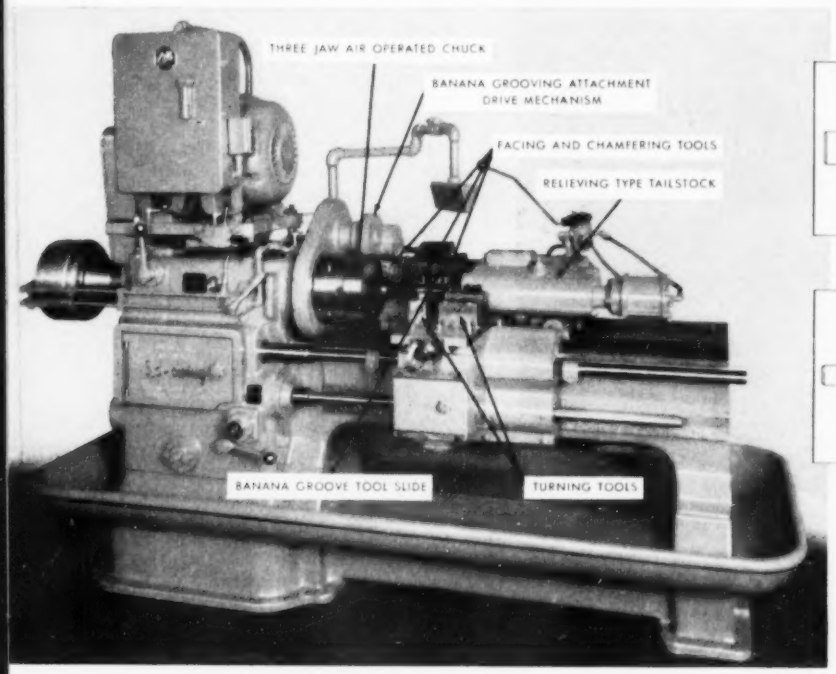

Fig. 1. *Model "LR" Lo-swing Lathe tooled for first operation.*

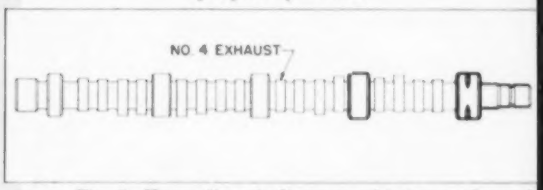

Fig. 2. *Heavy lines indicate machining performed in first operation.*

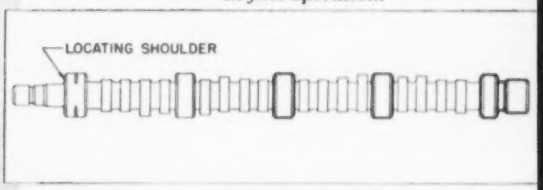

Fig. 3. *Heavy lines indicate machining performed in second operation.*

MODEL "LR" Lo-swing LATHE AUTOMATICALLY TURNS, FACES & CUTS BANANA GROOVE IN CAMSHAFTS

PROBLEM: To turn, chamfer and face all bearing and gear fit diameters and cut banana oil groove in definite relation to No. 4, exhaust cam on automotive camshafts.

SOLUTION: Two Model "LR" Automatic Lo-swing Lathes were tooled to handle this job in two operations as follows:

First Operation. Camshafts are delivered to the machine with both ends faced, centered, and straightened to required tolerance. The first operation lathe is fitted with a large bore headstock spindle and a special 3-jaw, air-operated chuck (Fig. 1). This spindle carries a center, located deep in from the chuck face, to support and locate the camshaft. The opposite end is supported on a revolving tailstock center. The relieving-type tailstock swings clear to permit straight-line work loading.

Before loading, the operator attaches a clamp dog, which fits into a groove in the chuck face, to No. 4 exhaust cam. This positions the camshaft in radial relationship to the timing of the banana grooving attachment, which is driven from the headstock spindle. High spindle speeds and coarse feeds with insert type carbide tools are possible with this drive which reduces unsupported length and insures extreme rigidity.

Second Operation. This lathe is equipped with the same chuck and tailstock but the banana grooving attachment is omitted. The camshaft is accurately located from the previously-machined shoulder (Fig. 3). A spring-loaded headstock center insures seating of the camshaft shoulder against the three-point locating stop within the spindle-bore. The camshaft is held and driven on No. 2 bearing, again minimizing unsupported length providing maximum rigidity.

Camshafts being machined are made of a special grade of cast iron. Hourly production at 100% efficiency is 90 camshafts. Bring *your* turning problems to Seneca Falls.

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turned from a visit to one. It's the new Carboloy plant for producing alnico, at Edmore, Mich, 165 miles north and west of Detroit. Edmore is a little farming village of 801 people, not even near a good-sized town, whose principal industries have been pickles, corn and sugar beets. The only factory of size is a pickle works.

General Electric opened its plant there a year ago, built to produce carbide cores for armor-piercing shot —but instead made the shot at the main Carboloy plant in Detroit and moved to Edmore a department that put standard carbide tips into standard tool shanks. To this is now being added an enlarged department to produce alnico in all shapes and forms. Carboloy has recently held its first open house for the townspeople, even though the plant is still unfinished. New equipment and equipment moved from Schenectady is all over the place, some working, some yet to be installed. But the method of producing alnico is clearly evident, and the townspeople have had much of their curiosity assuaged. They have been calling their town "Magnetic Edmore"—now they know why.

Magnets have always been a mystery. Children and adults, handed a pair of magnets, will unconsciously toy with them endlessly, feeling the mysterious force that pulls them together in one direction, forces them apart in the other. This is a force that man cannot see, so it interests him. And the people of Edmore are no different than others—except that they're more independent and self-reliant than city dwellers who've always worked for someone else.

As one travels outwardly from any major manufacturing city, many such satellite plants can be seen, tapping new labor sources and taking up the manpower released by the revolution in agricultural production methods, where the machine

"It really gives a man a feeling of accomplishment to win something like this in a crap game."

is taking over work once done by man. Such satellite plants are usually connected to a central main plant by frequent truck and car service, so research and development can be centralized for convenience and efficiency, while manufacturing can be dispersed for the same reason. There is the problem of finding skilled toolsetters, maintenance men, and supervision, but this can usually be solved by seeking out men who'd just as soon move back to the country because that's where they came from.

At Edmore, Carboloy invested about $1-million in the core plant, now has in about $3.5-million more. Of its current 375 employees (many of them women), 90 are on the tool job, the rest making alnico. Eventual employment is figured at 500—in a town where fewer than a thousand people live! Yet there are 3,500 names on the Edmore waiting list—people from a 15- or 20-mile radius. About 30% of current employment is farmers who have not worked previously in shops, so extensive training programs are required, as well as refresher films and work for supervisors. Space is provided in the plant for all of this.

As to alnico itself, the business is about $30 million, and 8 million pounds, a year. Limitations on cobalt and nickel have until recently forced 80% or more of alnico sales into military or essential items, but these limitations have now been removed. As more nickel becomes available, you may expect again to see such things as the refrigerator door with an alnico latch, and the kids playing with alnico-based dogs. Potential for the stuff is tremendous, in countless industrial and civilian uses.

FLYING TRIP

Speaking of plant visits, I recently made a very interesting series of sampling tours through five textile-machinery plants, one department of each plant. The trip was sponsored by the American Textile Machinery Association, a group of 52 member companies, all of which use metal in construction of their equipment. The trip was unique in that each of the five plants took extra pains to point out that it was merely representative of its competitors among the 52, listed them and showed pictures of their products as well as its own. It was also unique in that visiting one department in each was the equivalent of inspecting thoroughly one complete plant. Further it was made possible only by flying from plant to plant—a variation of the idea expressed by my preceding remark that the automobile has changed the industrial map.

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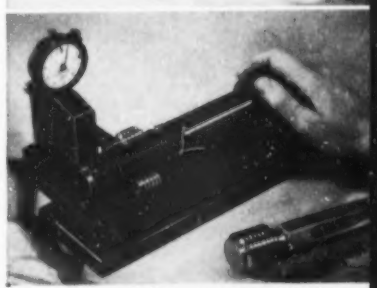

Photos courtesy of Standard Pressed Steel Co.

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The trip took off from New York and dropped in for an hour's visit to the model room of the Universal Winding Company near Providence, RI. Next stop was the new Edwards Plant of Saco-Lowell at Saco, Me, currently making rapid-firing 50-cal machine guns, and representing both the manufacturing phase of the industry and its cooperation in defense work. Back to Hopedale, Mass, for a full-blown clambake and the chance to meet executives of other association members, followed by a night at the Larches, private club of the Draper Corporation.

This brings to mind another development of recent years—the provision by large metalworking companies of guest facilities in small towns where hotels are inadequate or outmoded. Typical of these are the Homestead of IBM at Endicott, NY, the Sylvania club of Sylvania at Emporium, Penna, and Hartness House, operated by the three machine-tool builders in Springfield, Vt, the latter a full-fledged hotel in a private mansion.

The second day of the textile trip began with a visit to the very modern foundry of Draper Corporation, then by bus to the development department at Whitin Machine Works, Whitinsville, Mass, newly housed in a historical building. Finally, a tour of the assembly lines at Crompton & Knowles, Worcester, Mass, where looms are put together along time-cycle tracks.

Purpose of the tour was to acquaint textile-magazine and newspaper editors with recent progress. To that degree, I was a ringer, because a heddle and a slubber are all the same to me. But it did provide an opportunity to check on progress in equipment design and manufacture in the past two years (that has been considerable) and to see the increasing application of higher speeds, forged and formed parts of aluminum and steel to replace the traditional cast iron, and use of modern manufacturing techniques to hold equipment costs down.

Mill owners tend to fight modernization, for an understandable but short-sighted reason. With dozens or hundreds of machines of a given type installed, they tend to add units of the same vintage rather than to add new ones. This simplifies the spare-parts problem, and maintenance men are hard to find and train. But it holds down progress and raises costs beyond the economic, as such reasoning does anywhere. Equipment builders are fighting this tradition with extremely productive designs, but tradition dies hard. — EJT

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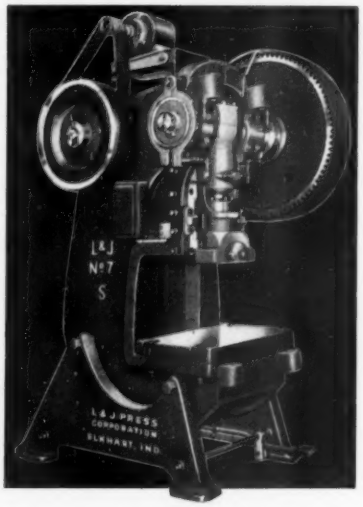

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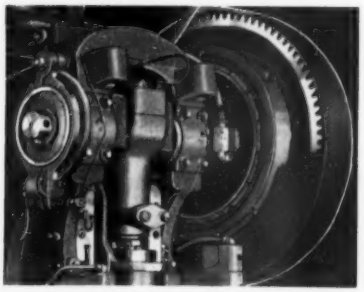

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ROUND TABLE Discussion

WHEN IS A TOOLMAKER?

Is it justifiable to promote a machinist to toolmaker if the man has never served a formal apprenticeship? If he proves equal to the job, shouldn't his lack of apprenticeship be overlooked in favor of ability?

THE WRITER (now a retired toolmaker) will endeavor to set forth his own reply which of course must be a compound one. A "no" for one situation and a "yes" for another. It all depends. There are as many different kinds of so-called machinists as there are house flies and the same goes for so-called toolmakers.

Let us start out with the man who learns to hit things with a big hammer and tighten nuts with a monkey wrench. He is a nice fellow, and a good, conscientious workman, so one day he gets the bright idea that he would like to be a machinist. He becomes ambitious, even talks the matter over with his wife. She, in turn, gives him the courage to have a talk with his boss. He does so, and in due time he is given what is commonly known as a break and is put to work on different machines. Here he learns the proper application of cutting tools to produce nice fits and finishes.

In due course of time, he has operated every machine in the shop and also turned out many nice jobs from his bench. He is now earning top pay and is called a machinist. In fact, he has gained so much confidence in himself that he threatens to quit unless he is given a raise. The foreman likes the man and knows he is an asset to the firm, but he is unable to give him more money. He might arrange to have him promoted to the toolroom where the rates are higher, but the idea of promoting the man to the toolroom might prove very difficult unless the toolroom is a large one employing many toolmakers of various skills who, in cooperation with one another, turn out a great variety of work. It is a good business policy not to expend the time of a highly skilled toolmaker on a job that can be done by another man of less skill. Thus, in the order of arrangements, if the machinist gets promoted, he would of course be assigned to the work requiring less skill. This means that he will work on jobs that can be done by a good machinist. From there on he

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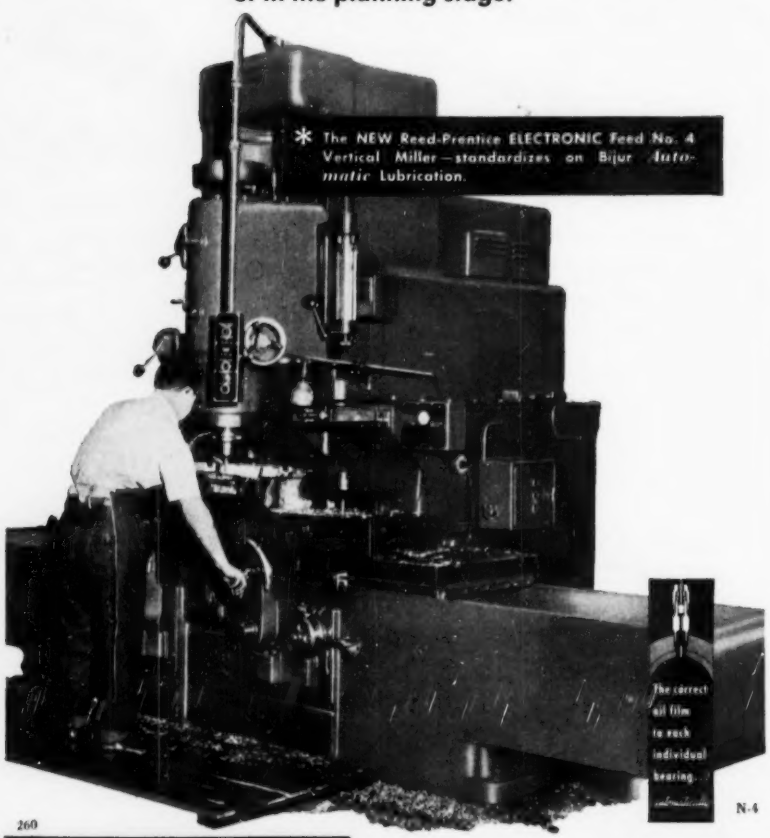
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continues to learn to be a toolmaker as he is entrusted to do work requiring a higher type of skill. Before he gets very far along the line he will begin to lose weight, his hair will turn gray, his eyes must be propped up with glasses. In short, he is actually beginning to look like a toolmaker.

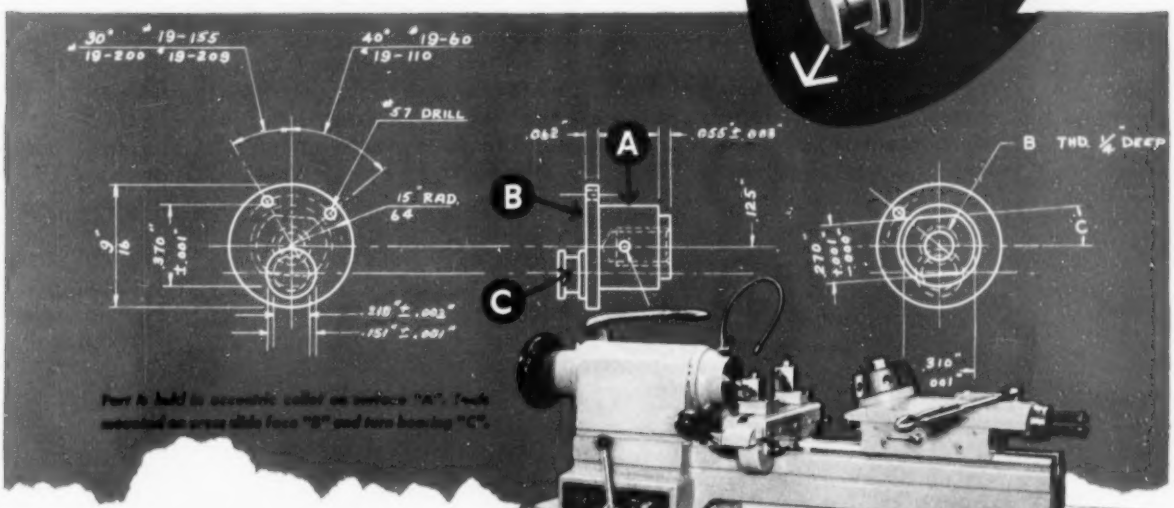
That is the answer to the question "When is a toolmaker?" and also fits the other question with a "yes" for promotion from machinist to toolmaker.

The "no's" have it if the machinist is promoted into a small toolroom because there we run into the human element such as suspicions that may arise among the toolmakers that the machinist may have been put there to undermine their own security. They will watch him like a hawk and will not be too liberal in giving him information on any job he may be trying to do. In short, the atmosphere in the toolroom is liable to turn sour, despite the best efforts of the foreman to prevent it. Down below in the shop there will be strange thoughts come into bloom and every Tom, Dick, and Harry will be hitting the boss up for more money in the hope that they too will be transferred to the toolroom.

"Pencoyd Charlie"
Hollywood, Calif

SINCE THE FORMAL APPRENTICESHIP is a fairly recent revival, I fail to see how the supply of toolmakers at the present time can be equal to the needs of industry. It is true that the system flourished up to the beginning of this century, but after World War I, when the engineering trade seemed to be in a state of suspended animation, the formal apprenticeship with the written agreement between both parties just disappeared. I recall that when I took up the engineering trade in 1925, straight from school, there was no such thing as a formal apprenticeship to engineering of any kind available, at least not in my home town. Most firms could not see how they were going

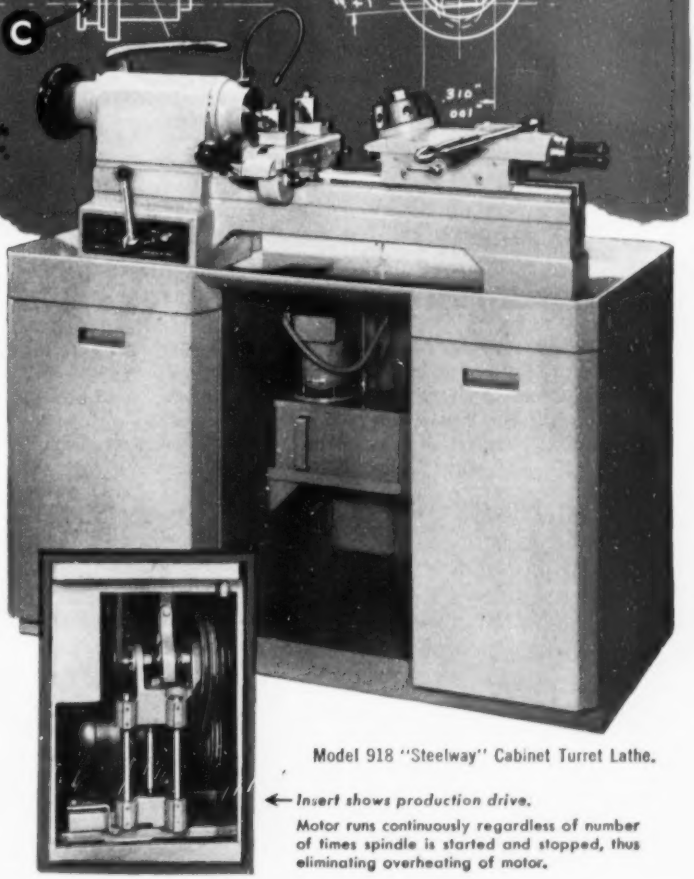
INSTANT start-stop boosts Penn Fishing Tackle parts to 250 per hour!



Penn Fishing Tackle Mfg. Co. practices what it preaches. Its officials went fishing recently —to catch some ideas for stepping up production on several eccentric parts. Investigation of the Rivett 918 "Steelway" Cabinet Turret Lathe revealed that machine with its production drive was ideally suited to their requirements.

This production drive features "split-second" starting and stopping of the lathe spindle by movement of the lever chuck closer handle. With one forward pull, the operator closes the collet on the work, releases the brake and engages the spindle drive. When the lever is pushed back, the spindle drive is disengaged, the brake mechanism is applied and the work is released.

Installation of the 918 "Steelway" turret proved immediately successful. Production of troublesome parts was boosted two-fold. A 918 "Steelway" can boost your production, too! Why not go fishing and see what savings can be caught!



Model 918 "Steelway" Cabinet Turret Lathe.

← *Insert shows production drive.*

Motor runs continuously regardless of number of times spindle is started and stopped, thus eliminating overheating of motor.

RIVETT

RIVETT LATHE & GRINDER, INC., DEPT. AMR 113 BRIGHTON 35, BOSTON, MASS.

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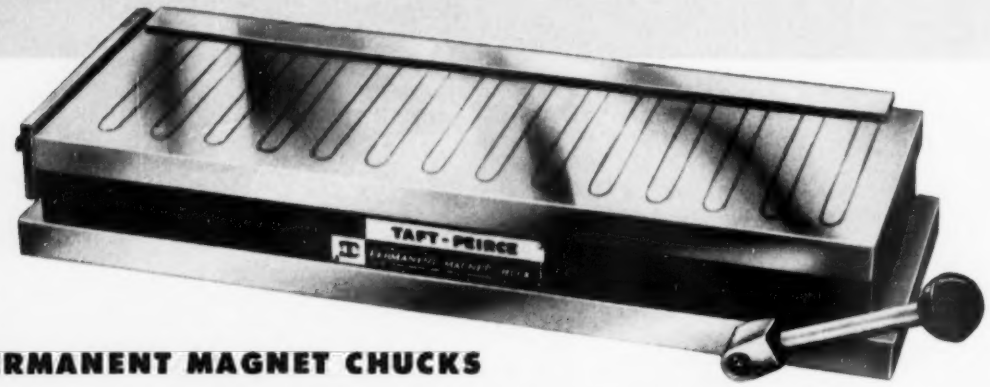
When it comes to choosing a chuck, look for the one that gives you the *fastest* setups . . . the *safest* setups . . . the *most* setups for any particular job — without constant repairs and replacements. The following comparisons should serve as a useful guide.



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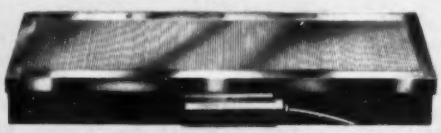

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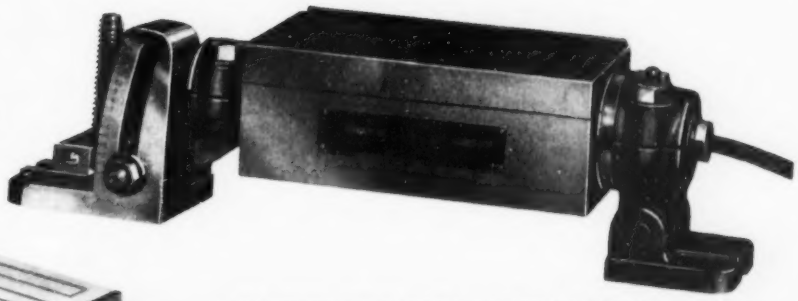
T-P Superpower Magnetic Chucks for greater flux penetration and versatility. Holds a wider variety of sizes and shapes. Permits mounting parts well above the face plate level. All T-P Magnetic Chucks *pack more power* in less space. Increase variety, speed, and safety of setups.

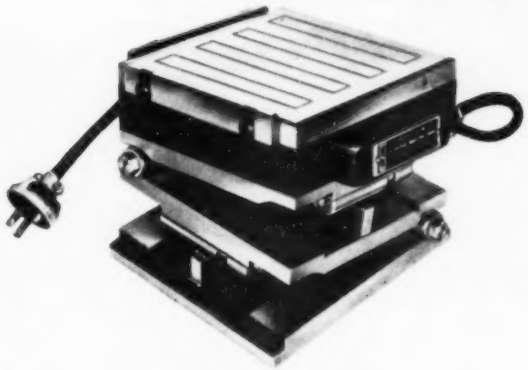
T-P Superpower Fine Mesh Chuck provides finer flux concentration . . . safely secures small or thin sections formerly found impractical for magnetic chucking.

T-P Longitudinal Chuck for wide variety of work. Most versatile yet devised, it handles both large and small sections with equal ease.

Available for all sizes of machine tool tables.

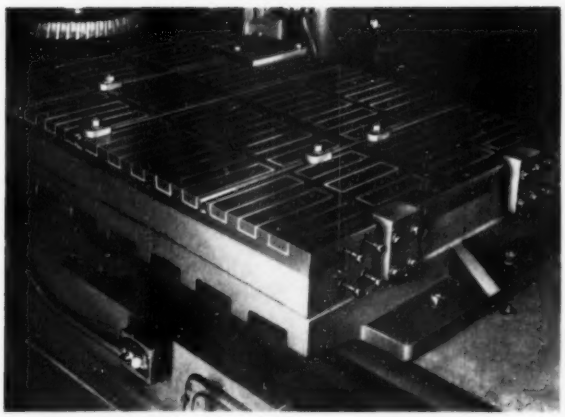
ADJUSTABLE CHUCKS





T-P Superpower Precision Duplex Chuck. Saves setup time when grinding or machining formed tools, simple or compound angles, and dressing carbide-tipped or steel tools. Swivels to 90° on either side of horizontal. Tilts to 14°. Clamps rigidly at any setting.

T-P Superpower Sine-Angle Chuck. Speeds positioning of tricky angle grinding jobs. Gage blocks placed between roll and base plate assure high precision of single or compound angle setups. Many other T-P adjustable chucks are also available.

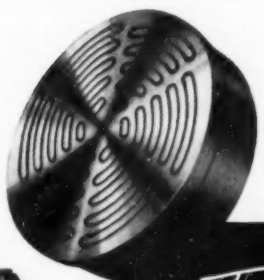


SPECIAL CHUCKS

T-P Superpower Chucks can be custom-built to solve unusual problems. One shown at left is special 55½" x 40", built to hold cast iron loomsides on a 75 HP milling machine — while three 18" carbide cutters and two 4" mills take ¼" cuts simultaneously *at 30" per minute.* Its greater holding power, smaller size, and high efficiency are typical of all T-P Superpower designs — whether special or standard models.

ROTARY CHUCKS

T-P Superpower Rotary Chuck for rotating spindles. Provides greater work range and efficiency than other makes with its greater holding power and compactness. Available in standard sizes. Also with fine mesh face plate for small pieces.



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T-P means Top Precision

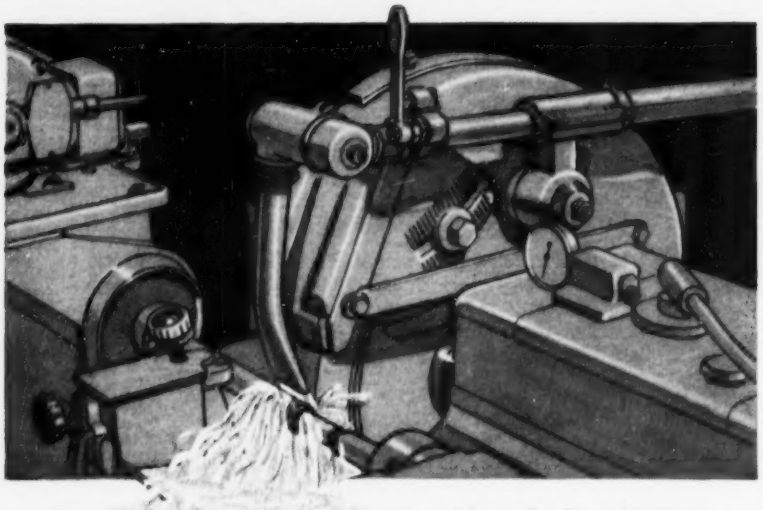
T P

THE TAFT-PEIRCE MANUFACTURING COMPANY

WOONSOCKET, RHODE ISLAND

ECONOMY *Transparent* COOLANTS

For Closer Control of Grinding Operations



Economy Transparent Coolants for wet grinding offer big advantages — they enable the operator to see the work, gauge blocks or crayon marks clearly — insure greater accuracy and higher production. The Economy line offers you a choice of *Two Water-Soluble Transparent Grinding Coolants* —

ECONOMY LIQUID 1500
— the light-green transparent coolant

ECONOMY LIQUID 2037
— the water-white transparent coolant

Both of these coolants are being used with outstanding success for critical grinding — they are recommended by many machine tool manufacturers. When you use Economy Transparent Coolants you get these advantages —

- **Unusually open and free cutting wheels**
- **Extremely rapid chip settling**
- **Clean machines**
- **A coolant agreeable to the operator**
- **Excellent rust protection**
- **Freedom from foam**
- **Exceptional stability in storage**
- **A long-lasting "sweet" solution**
- **Parts are easy to handle — not slippery**

ALL OF THESE ADVANTAGES AT A COOLANT COST OF ABOUT 1¢ A GALLON

ECONOMY METALWORKING LUBRICANTS — THE WBCo

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ECONOMY METALWORKING LUBRICANTS
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THE WHITE & BAGLEY COMPANY
WORCESTER, MASS. • DETROIT, MICH.
Originators of Grinding Lubricants

to stay in business, and the signing of long-term agreements with apprentices was impossible. The result is that men of my age can tackle any machine shop job likely to arise, including toolmaking, and yet we could not state honestly that we had served an apprenticeship in actual toolmaking.

This situation regarding the status of toolmakers holds good in the British engineering industry at the present time and, so far as I am aware, no one is worrying unduly about it except to deplore the dearth of skilled men with plenty of practical experience in iron fighting. Although the trade union movement, the Guild system, and all the other "closed shop" principles were started in Britain, nobody has the nerve to try and divide skilled machinists into watertight compartments labeled "Toolmakers" and "Others." I maintain that it is impossible to draw strict lines of demarcation between one type of machine shop work and another. A man with 25 years or more practical machine shop work behind him, who has gained his experience in various shops, can usually tackle anything that comes along.

The whole trouble is that people who ought to know better assume that toolmaking is a mysterious art, the secrets of which are known only to those men who have gone through some form of initiation. It is nothing of the kind; the toolmaker works in metal, like all other machinists. There is a practical limit to the shapes he can produce and the machining operations he can perform. Standard commercial products, such as automobile engines, or knitting machines, are far more difficult to make than engineer's jigs and tools. Why should it be assumed that the man who makes such products cannot tackle toolmaking with equal ability?

Of course, the way an industry is

"While my father, J C Higgins, Sr, is in the hospital I have decided to introduce a few innovations in the business that —"

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

Bethlehem's large tool steel depot carries a complete range of sizes in 24 different grades of steel, to facilitate rapid shipment to distributors.

Prompt Service?
See Your Tool Steel Distributor

Being Johnny-on-the-spot is but one of many services performed by the tool steel distributor. He knows what's needed in your area, and to make sure your requirements are met promptly, he keeps large stocks of tool steel on hand. You'll find him always ready to lend you a helping hand, too, whether you require a simple operation like cutting bars, or something much more complex, such as determining the kind of heat-treatment needed.

It's all to the good when you have a tool-steel distributor near you, for then it's not necessary to carry large inventories. What's more, the distributor often has a supply of other steel specialties that you may need.

All distributors of Bethlehem Tool Steels are friendly, reputable firms, well known for their good service. They're good people for you to know. Our hat is off to them for a fine job — each and every one.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Don't Use Fresh Water for Quenching Tools

It makes no difference what the source may be — fresh water is simply unsuitable for the quenching of tools. For all fresh water contains dissolved gases, which are released at the surface of the tool when it is quenched. The small gas pockets thus formed can prevent contact between the tool and water, and the resultant ineffective quench causes soft spots. These soft spots are likely points for cracks to occur in the tool.

A good way to avoid this trouble is to quench in water which has been boiled to remove the dissolved gases. Suppose the water cannot be boiled? Then expel the gases by quenching a large amount of hot "dummy" material. Even better would be a 10 pct brine solution, made up using degassed water.

New Booklet on Bearcat Tool Steel

We recently issued an attractive 2-color booklet on Bearcat Tool Steel — the versatile general-purpose steel that is so well suited for applications involving high shock-resistance. The 8-page illustrated booklet contains a wealth of information about Bearcat — goes into considerable detail about its hot-work and easy-machining properties.

Bearcat is a super steel in every respect. It is air-hardening, thus minimizing quenching hazards, and it has good resistance to distortion during heat-treatment.

OTHER ADVANTAGES OF BEARCAT

In addition to superior shock-resistance, Bearcat has these other important advantages:

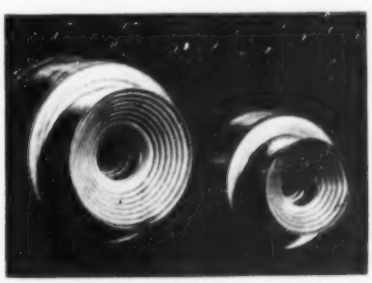
1. Deep hardening
2. Easy machining (Brinell 197 max)
3. Low distortion in heat-treatment
4. Good hot-work properties
5. Easily carburized for long wear

TYPICAL ANALYSIS

C	Mn	Si	Cr	Mo
.50	.70	.25	3.25	1.40

Bearcat is especially recommended for both hot- and cold-shock applications such as rivet sets, chisels, punches, hot headers, and gripper dies. It is also ideal for short-run dies used in cold-forming, blanking, and bending, as well as for engraving dies, die-casting dies, and master hobs. It has many other uses, too.

It will be worth your while to look into Bearcat. Why not talk it over with your Bethlehem tool steel distributor? And of course you'll want to read the new booklet on Bearcat. Write to the Publications Dept., Bethlehem Steel Company, Bethlehem, Pa. Ask for Booklet 341.



Here's a typical use for Bearcat — general-purpose dies requiring a high degree of toughness. These dies are used to produce aluminum impact-extrusions.

Food Machinery Operation Improved

Mr. E. J. Kelly, Sales Manager of C. E. Howard Co., manufacturers of storage tanks, agitators and pasteurizers for the chemical and food industries, gives these reasons for using Slo-Speeds on their equipment.

1. *High efficiency of rugged, simplified, precision helical gear system.*
2. *Streamlined design for ease of cleaning.*
3. *Protected housing design.*
4. *Compactness of minimum installation space.*
5. *Positive oil seals.*
6. *Low maintenance.*

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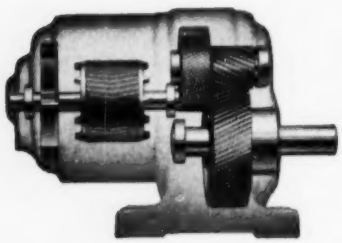

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Simplified gear system — balanced design — compact — rugged — highly efficient — abundant lubrication — low output shaft — positive oil seals — Herringbone Rotor — protected — streamlined — direct through ventilation — quiet operation — AGMA speeds — extremely long life — every unit will operate in any position.

20-page illustrated catalog... Sterling Speed-Trol, Slo-Speed, Klosd and Klosd-Tite Electric Power Drives. Write for catalog No. 1-D-410.

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organized to do its job has a lot to do with the attitude in which its workers are judged. In the automobile plant, for instance, it would be an unusual man who could be taken off the assembly belt and expected to do a job in the toolroom. He is not a machinist at all, and probably does not aspire to be one. On the other hand, we must not lose sight of the fact that big engineering organizations are the exception and not the rule. The small shop predominates on both sides of the Atlantic and versatility in its workers is one of the reasons for its continued existence. They must have skill, initiative, and experience in order to do their work. In general machine shops which take on any form of subcontract work, there is no room for a group of high priests whose temple is the toolroom. Tools are put through the shop in the same way that any other subcontract job is progressed. This system works well and is, to my mind, the sensible way in which to tackle toolmaking.

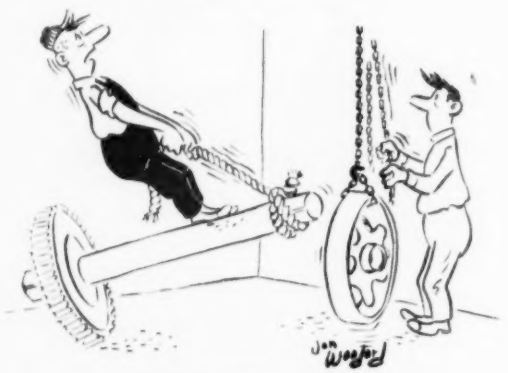
I will admit that press toolmaking calls for some specialization on the part of those who have to do this kind of work. But if a press tool is analyzed, it will be found to consist of various details which could be made in a general machine shop if they were controlled properly by decently made detail drawings giving all the information required, and having sensible machining tolerances and grades of finish. The reason why press toolmaking is considered to be the highest grade of toolmaking skill is because half the press tool designers have no idea how to make a proper engineering drawing. The things left unsaid on the drawing have to be filled in by the toolmaker. Why this state of affairs is allowed to continue is beyond me. I do know that firms who have had to make press tools with interchangeable parts, so that the tools and parts could be shipped from parent firms to subsidiary organizations overseas have not found any particular difficulty in doing it, and have not found their press tools any more expensive than those made by traditional cut-and-try methods.

Any attempts to make the toolmaker a member of a hierarchy in the engineering profession should be resisted valiantly by all concerned. If the organization of a firm is such that it allows toolmaking to become a closed shop system, the remedy is to de-skill all tool work. This can be done by ignoring the fact that a product to be manufactured is a tool. The tool should be detailed and production drawings prepared for feeding into the shop just as if it were a standard engineering product. This practice works successfully for some very fine engineering firms.

Toolmakers who think they are little tin gods should cast their minds back to some of the surprising things which happened in engineering during World War II when professional photographers became chief inspectors, printers surprised everybody by becoming first rate tool designers, and machinists were up-graded from the shop floor to become works superintendents. I know of many such instances, and the surprising thing is that most of these new converts to engineering are still doing their jobs with a high degree of skill.

One thing I have learned about engineering is that nothing is static, nothing cut and dried. Rules and regulations made today must be thrown out of the window tomorrow; brains and skill are not the monopoly of a chosen few. The special title of toolmaker should be dropped and the title "general machinist" substituted, because that is what most toolmakers are.

Clifford T Bower
London, England



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Only one of its kind in U.S.A. . . . the latest with accuracy far greater than obtainable by any other method.

The wave length of certain red lines in the spectrum of cadmium have long been recognized as one of the truly stable units of measurement. The Zeiss Opton Interferometer employs this wave length, and is now used by Webber for all master inspections.

The inherent error of electronic gaging is eliminated. A beam of light that is accurate to 1/10 of one-millionth of an inch is the only contact between surfaces to be measured.

Any disagreement over the accuracy of master gages that cannot be reconciled by electronic comparators can now be corrected with the interferometer. It is the first truly practical method of employing the most stable yardstick in the universe: the wave length of light.

Not only does the interferometer measure linear length, but with the aid of an accessory microscope, also measures surface finish that will detect scratches so fine that even though they are less than .000001" in depth, they are plainly visible to the eye.

By the introduction of these methods, Webber establishes an inspection method of which there is no equal anywhere in U. S. A. Webber Gage Company, 12901 Triskett Road, Cleveland 11, Ohio.

Webber

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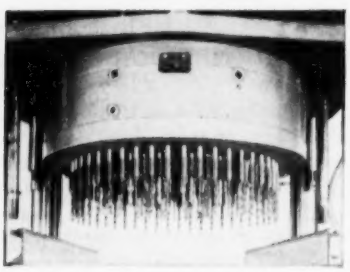
Zagar's Exclusive, Rigid 4-Post Construction Permits Hundreds of Holes to Be Drilled in RECORD TIME!

Zagar engineering brought down the time of drilling this part from three hours to seven minutes.

This jet engine part suggests the almost unlimited possibilities in drilling hundreds of holes at one pass. Zagar 4-post machines are built around interchangeable gearless drillheads. Any number of holes on all centers can be drilled as close as twice drill diameter in any material. Zagar's 4-post machines achieve heavy duty, multiple-spindle, close center drilling. . . with greater horsepower and thrust, with better alignment and accuracy, with less breakage of *small drills*. . . Let our engineers calculate your savings by demonstrating the Zagar method.



Zagar Interchangeable Drillhead.

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Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

PORTIONING OUT THE PIE

How can one worker be paid more than the other men if he is doing additional jobs for the foreman? Is a shop-wide job evaluation system the solution to this problem?

I THINK ED UNINTENTIONALLY gave at least part of the answer to Al's problem, which is all too common, largely because real job rating is not used as much as it should be. When it comes to the production of duplicate parts, the old, straight piecework system worked well until the men earned more than the boss felt they should. He never seemed to realize how much his machine overhead was reduced by the increased production. He only looked at the payroll to see how it compared with the regular day rate of pay.

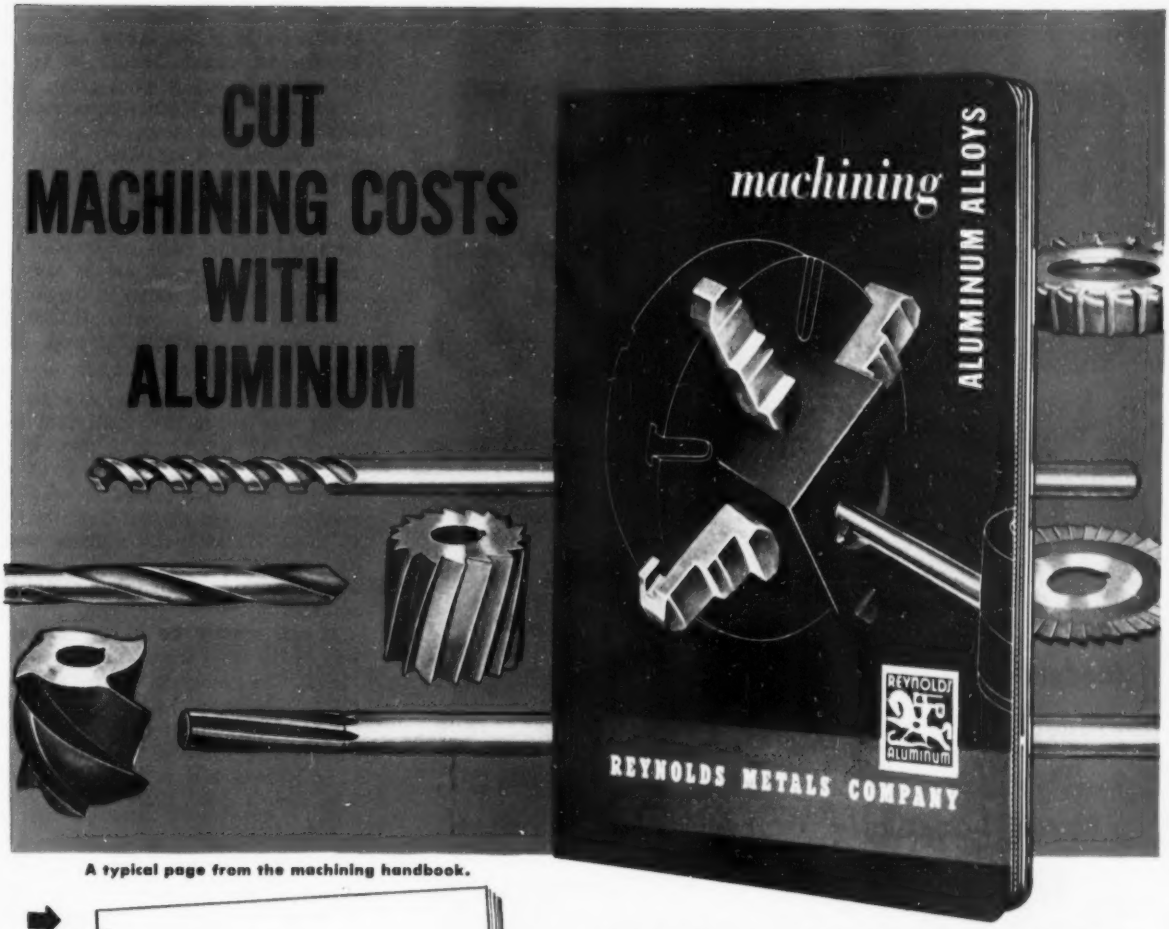
Hanson's case is quite different. He really has two jobs — his regular work, and his training of new men, which certainly puts him in a different class, and makes him worth special consideration.

Job rating does not seem to be sufficiently understood. It is much more difficult than mere time-study and rate setting, and it is of greater importance in many jobs, such as Hanson's. Some parts that are hard to classify may be more important than the actual production of machine parts. This might include design, selecting the best materials, tool design, and the routing of work.

Job rating might also extend to the executive offices, especially where sons and sons-in-law are too often given jobs and salaries that do not make for economical operation of a company. And while job rating may hardly include seniority, this is a problem that too often affects both position and salary more than it should in many plant activities. Proper consideration of seniority can help overall efficiency.

"May I suggest the help-wanted page, Houser?"

CUT MACHINING COSTS WITH ALUMINUM



A typical page from the machining handbook.

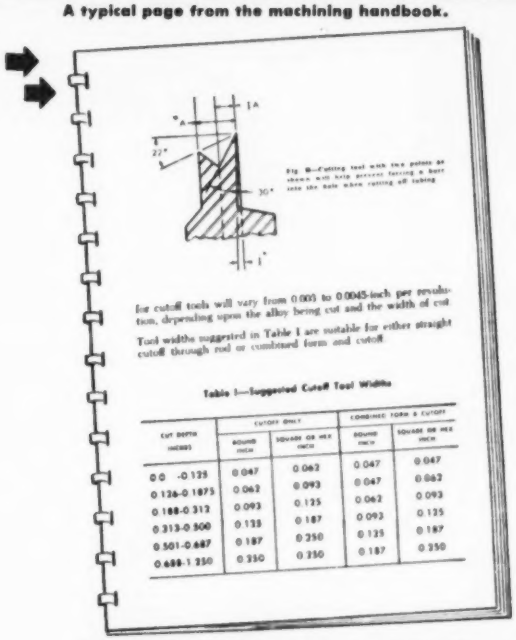


Fig. 8—Cutting tool with two points as shown will help prevent forcing a burr into the hole when cutting off tubing

For cutoff tools will vary from 0.005 to 0.0045-inch per revolution, depending upon the alloy being cut and the width of cut.

Tool widths suggested in Table I are suitable for either straight cutoff through rod or combined form and cutoff.

Table I—Suggested Cutoff Tool Widths

Cut depth inches	Cutoff only		Combined form & cutoff	
	Round inch	Square or hex inch	Round inch	Square or hex inch
0.0 -0.125	0.047	0.062	0.047	0.047
0.126-0.1875	0.062	0.093	0.047	0.062
0.188-0.312	0.093	0.125	0.062	0.093
0.313-0.500	0.125	0.187	0.093	0.125
0.501-0.687	0.187	0.250	0.125	0.187
0.688-1.250	0.250	0.250	0.187	0.250

THIS HANDBOOK* TELLS YOU HOW

The handiest, most helpful handbook you can get on the machining of aluminum alloys is yours for the asking. This book evaluates the various aluminum alloys and recommends machining methods and tools that give maximum production economies. There is a special section on automatic screw machining. Every designer, production engineer, plant manager and machine shop superintendent needs this 124 page "Machining Aluminum Alloys" on his desk. Write on business letterhead for your FREE copy and a complete index of Reynolds technical literature to Reynolds Metals Company, 2523 South Third Street, Louisville 1, Kentucky.

*One in a series of handbooks on aluminum design and fabrication.

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COMPANY

This, however, means that seniority should be only *one* factor among a number of others. Length of service alone is not a good guide for promotion. This applies to executive positions in the shop, in civic organizations, and especially in Congress.

With job rating done intelligently and made clear to the men in the shop, Al should have no trouble in giving Hanson what he is worth without upsetting others in the shop.

Fred H Colvin
Point Pleasant, NJ

I ONCE KNEW of the owner of a small plant who made the crack that he never gave a raise to a man who asked for it. This fellow was good to his help and went out of his way to see that they got all that was coming to them. He took the attitude that he was the one who should judge a man's worth to him, and not the man himself.

It can readily be seen that this was in the days when the man who put up the money in the first place felt that he should have the complete say-so, regardless of the thoughts of others. Now it seems that the tables have turned, and it is the worker who does a good share of the dictating.

In an organization where wages are set to a schedule in a spirit of justice, and then one individual comes along and considers his services worth more than the others, we have to handle the situation with kid gloves if we do not wish to throw a monkey wrench in the plan or lose the services of a good man. One cannot be reckless in his dealings with those who think that they should be getting more money because we create the old spiral evil wherein others become dissatisfied, and lose no time in putting the bee on the boss for some of the honey.

We must not lose sight of the em-

ployees who think constantly in terms of more pay. Some have a system worked out whereby they can get more money by constantly changing jobs. I had a talk with a chap just a little while ago who informed me that the best way to get more money was to play the ends against the middle. When I asked him if he thought shifting around paid off, he replied: "Sure! I got it figured out this way—you tell the boss you want more dough, and when he sees that you are going to quit if you don't get it, then he weakens because statistics prove that a high turnover is very costly to the firm and he doesn't want to get his neck in a sling." An employee who maintains this status by way of constant threats is a bad investment for any firm, and the quicker he is dropped from the payroll the better for all concerned. An offer of a few cents more an hour will bristle the hairs on the back of his neck, and he's off again.

The good executive will go to bat for his men if he thinks that they should get more pay. If he is the type who feels that he will be feathering his own nest by trying to keep wages down, he will soon find that some of the feathers have thorns in them. When the men know that their foreman is doing his best to see that justice is meted out, then he will reap the reward of sound cooperation and loyalty.

I am not in favor of creating a situation whereby the foreman will have a good excuse for raising a man's pay—such as creating a job for the purpose of surmounting an established wage and assuaging the gripes of rebellious workers. Why not be honest about it? If a man asks for a raise because he feels that he is of more value than the rest, and he is already getting the limit for

"I tell you that spring won't fit — it came out of my watch."

for a fabulous finish...

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Abrasive Belts

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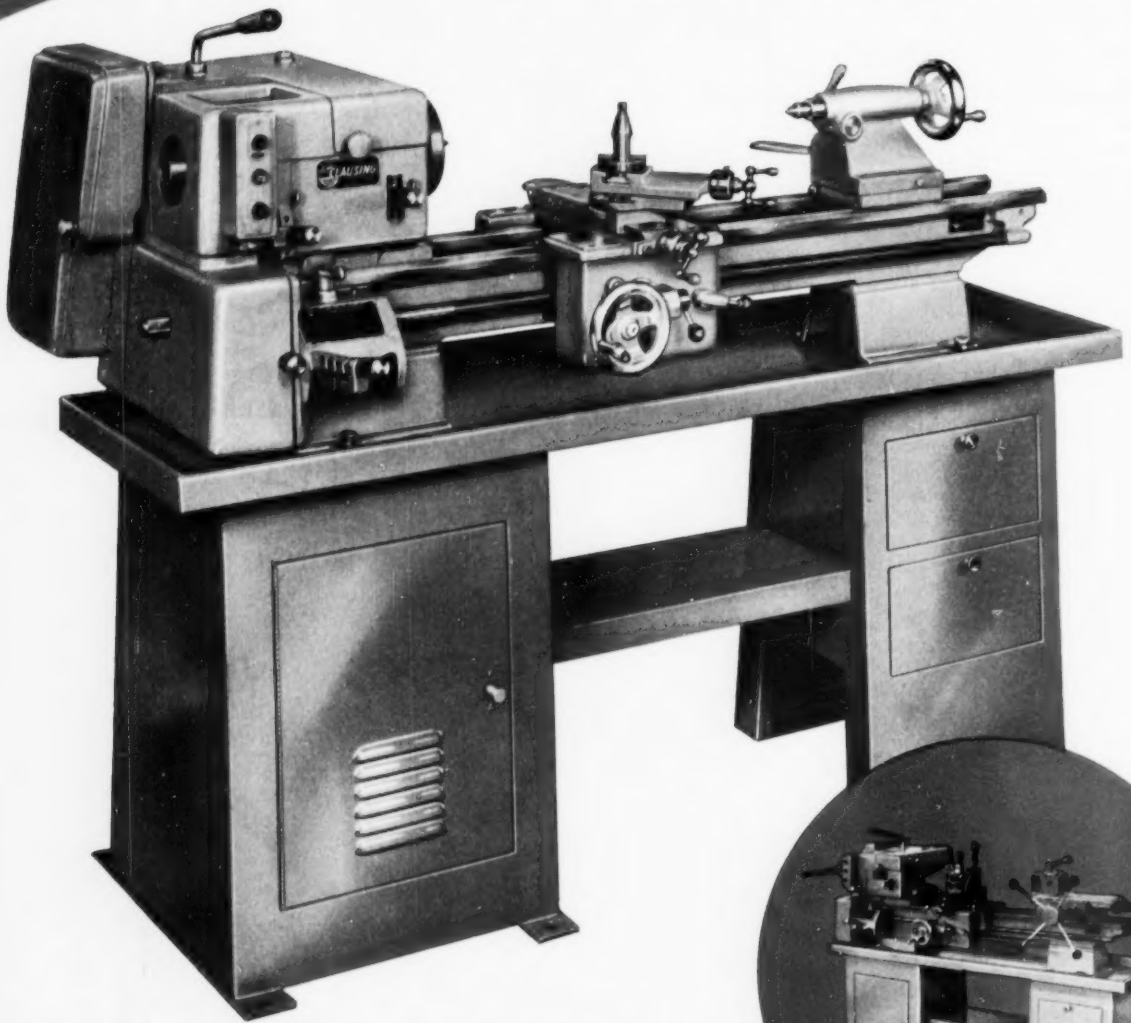

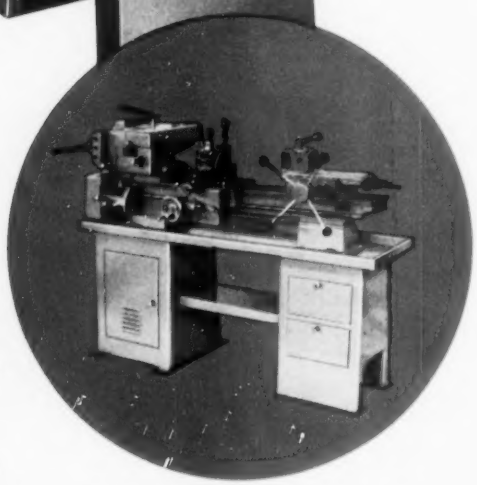

No. 5300 Clausing lathe equipped with lever type collet chuck, lever type carriage turret, bed turret for production hand turret operations.

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CAPACITY	Swing: 12¾" over bed; 12½" over saddle wings; 8½" over saddle. 24"-36"-48" between centers.
THREAD RANGE	48 selections. 4 to 224 Standard, right or left.
SPINDLE SPEEDS	Direct: 173, 272, 454, 492, 780, 1300 RPM. Backgeared: 29, 46, 77, 83, 132, 220 RPM.
SPINDLE	Nose, 2¼" - 8 threads. Bored for No. 4½ MT, with reducing sleeve to take No. 3 MT 1⅜" hole thru spindle. 1" collet capacity.
COUNTERSHAFT DRIVE	Built-in, with clutch and brake. ⅝" wide B-belts. 3-step spindle pulley, 2-step motor pulley.

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PRECISION MACHINE TOOLS
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For production capacity, accuracy and profit potential, the brilliant new CLAUSING 5300 gives you more *Plus Value* features than have ever before been available in a 1″ collet capacity lathe . . . at or near its price!

CAPACITY PLUS! 12″ swing + 1⅜″ hole through 16″ long spindle + 2¼″-8 thread spindle nose + 1″ collet capacity + heavy duty No. 3 MT tailstock with tang socket + ⅞″ diameter lead screw + 12 speeds, 29 to 1300 RPM + 9″ cross slide travel + 2¾″ tool post slide travel + up to 48″ between centers = Bigger Tool and Job Capacity . . . Wider Work Range!

ACCURACY PLUS! New heavy-duty headstock and tailstock . . . massive bed and carriage . . . for maximum rigidity and stamina + headstock diamond bored for husky Timken "Zero-Precision" tapered roller bearings, the most accurate used in any lathe + forged steel, precision ground spindle with hardened nose + headstock, carriage and tailstock hand fitted to precision ground Vee and flat ways of bed = Greater precision . . . Closer tolerances!

ECONOMY PLUS! Built-in countershaft with friction clutch and brake permits instant starts and stops of spindle without stopping motor + oil flinger spindle bearing lubrication + long wearing steel cable B-section V-belt drive + automatic apron with splash lubrication + instant selection of 48 threads or feeds = Savings in Time . . . Increased Production . . . Longer Life!

New Pedestal Base and Pedestal Cabinets! New pedestal bases and pedestal cabinets are 3/16″ steel plate, welded and braced with thick box-type channeling . . . rigid foundations for accurate lathe work. Cabinet, illustrated at left, has drawers in tailstock pedestal . . . base has plain tailstock pedestal. Both have shelf between. Be sure to see the new Clausing 5300 at your Atlas-Clausing dealer's. Feature by feature comparison will prove it's the Biggest PLUS Value in Lathe History!

BENCH LATHE, 24″ CENTERS	$715.00	PEDESTAL BASE $160.00	PEDESTAL CABINET $200.00
BENCH LATHE, 36″ CENTERS	745.00	PEDESTAL BASE 165.00	PEDESTAL CABINET 220.00
BENCH LATHE, 48″ CENTERS	830.00	PEDESTAL BASE 175.00	PEDESTAL CABINET 240.00

Prices are less motor and are F.O.B. factory, Ottumwa, Iowa. Prices subject to change without notice.

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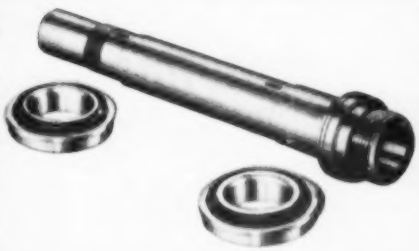
QUICK CHANGE MECHANISM Provides instant selection of 48 threads or feeds. ⅛″ wide steel gears. Ground shafts turn on ball bearings. Plunger-type selector control.

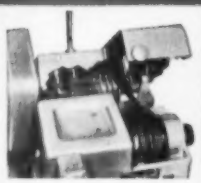
PRECISION GROUND BED Massive, semi-steel bed is 7⅝″ wide, 5⅛″ deep — thickly ribbed and braced. Vee-ways, flat ways and undersides are ground. Built-in screw-type leveling jacks.

1″ COLLET CAPACITY LATHES

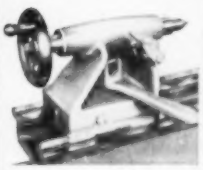


BIG PRECISION SPINDLE WITH "ZERO-PRECISION" BEARINGS. Precision ground, forged steel spindle turns on widely spaced heavy-duty Timken "Zero-Precision" tapered roller bearings — bearing run-out tolerance is .00015.

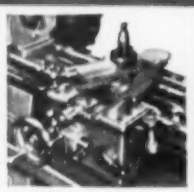
MASSIVE HEADSTOCK Massive headstock casting weighs 45 lbs. Heavy duty construction, plus malleable iron countershaft bracket anchored and doweled to casting to bridge drive opening, assure accurate alignment and rigidity for "the heart of the lathe."



CLUTCH AND BRAKE EQUIPPED COUNTERSHAFT Friction clutch-brake that permits instant starts and stops of spindle without stopping motor. Belts are fully guarded.



LARGE TAILSTOCK Heavy-duty tailstock has No. 3 MT ram with tang socket. Swing-type wrench, permanently attached, control: bed lock.



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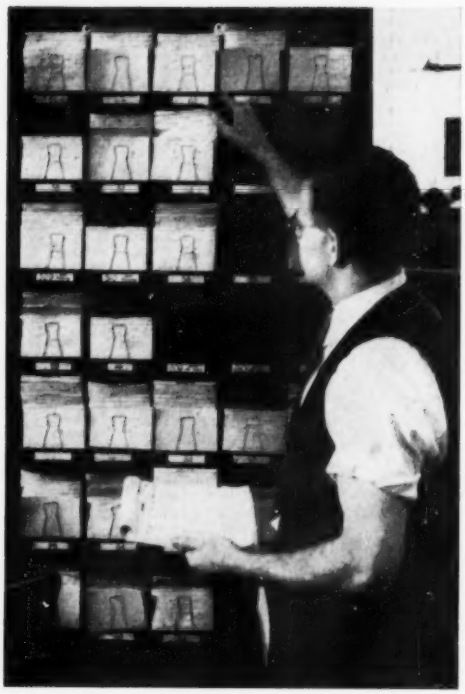

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his class of work, then he should be informed of the fact, and if he then isn't satisfied, let him do one of two things: take it on the chin, or else pack up his tools and scram for another job.

The foreman, who has to take care of his own reputation, is between the devil and the deep blue—the dissatisfied worker and the superintendent. If an unusual worker comes along who is such a good man that it is very obvious that he should be paid a higher rate, he should be told that he would have to accept the prevailing wage. Let him understand this right from the beginning so that there will be no misunderstanding. The foreman obviously has his hands tied and cannot act as his conscience dictates, and has to suffer by losing a good man.

I've seen men who were worth twice what they were paying for top pay and either through pride or sound business reasons wouldn't stay on when a wage boost was denied. Management cannot see the real worth of a man as well as the foreman can but, strange to say, the word of the foreman is not taken at its face value. Management must be made to realize that extenuating circumstances oftimes justify readjustments. How to do this is a matter for a magician to handle. You, as a foreman, may undertake to do it.

Jack Everett
San Francisco, Calif

JOB EVALUATION has been with us since long before the first Pharaohs got started on the Pyramids and it is a safe bet their taskmasters ran into the same problem that their

". . . Just keep on with your production, Mr Jones, but should your machine break down at any time I wonder if you'd mind stopping in my office for a moment; as your foreman, I'd like to get to know you better."

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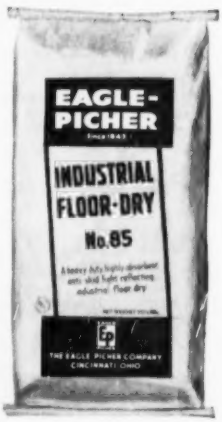

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modern prototype, Al, is wrestling with today. Of course, the methods of dealing with the situation have changed.

In Pharaoh's day, the taskmaster's solution to the problem was simple and direct, and very often final, at least so far as the unfortunate Hanson of his day was concerned.

Nowadays the foreman's task is more complicated by reason of the adoption of more humanitarian methods. About the only form of direct action Al can indulge himself in is the rather dubious solution of cutting Hanson adrift from the organization; and that still leaves him with his problem and the trainees on his hands. Frankly, I don't believe the shop budget should be so inflexible that a few cents more an hour cannot be allocated in a contingency such as this. If Hanson is capable enough to keep up his regular work and look after the new men successfully, then no one can blame him for feeling that the extra effort deserves extra recompense.

In Al's shoes, I think I would take the matter up with the front office, at least that section of the brass that has to do with loosening the purse strings. As far as the rest of the men are concerned, there always is a certain amount of grumbling when one of their number receives a little extra recognition. But if he is really deserving of it, the grumbling soon subsides. Here again is where a shop with good employee relationship and morale has the edge over a shop with a lesser degree of employee goodwill.

I am inclined to go along with Ed in his statement that job evaluation —in the strictly modern sense—carries with it a load of headaches, especially when you are dealing with a skilled personnel, such as toolmakers and all-around machinists, and should not be attempted without considerable study. Where it can be used successfully, in my opinion, is in a plant where semi-skilled help predominates, and where a certain amount of automation is the rule rather than the exception. Even in such a case job evaluation should be a top-to-bottom proposition and not confined to one shop—which is the idea that Al seems to be toying with.

Returning again to the shop budget, I remember a foreman I used to work with who had a system of his own to cope with unexpected financial emergency. He would set aside five per cent of his budget requirements in what he called a contingency fund. If we ran into a job that required extra tooling, he dipped into this fund. Or, if we happened to

The second of two articles on profits

What Are PROFITS Used For?

This is the second article on the role of profits in our economy. The first was addressed to the question: "How High are Profits?" The answer was found to be: not high when compared with previous years and the present investment in corporate facilities. This second article is addressed to the equally important question: "What do corporations do with their profits?"

In 1953 corporations will earn about $20 billion *after taxes*, if the recent rate of earnings is maintained throughout the year. These profits will be used (1) to expand and improve productive capacity through purchases of new plant and equipment, (2) to finance the operations involved in a growing volume of business and (3) to reward the people who have invested their money in American industry. Of the $20 billion, the corporations will pay about $9 billion to their stockholders as dividends. They will use the $11 billion that remains to purchase new plant and equipment and to increase their working capital.

This year corporations are increasing their plant, equipment and working capital by a total of approximately $32 billion. Of this amount, about $26 billion is for new plant and equipment. The remainder is for working capital. As this article will show in greater detail, about $21 billion of this will come from depreciation allowances and sales of new securities. The other $11 billion will come from retained profits.

It is impossible to trace exactly how each dollar of retained profits is spent. This money is mixed with other money that goes into the company treasury in the form of proceeds from loans, sale of securities and depreciation allowances. *However, it is a fact that by retaining $11 billion of their profits this year, corporations have provided $11 billion toward their total capital requirements, including the money needed for expanded and improved capital equipment.*

Profits Mean New Plants

This year American industry is engaged in a very large expansion of plant facilities. This will increase the industrial capacity of the nation by about 7 per cent. Since 1950, our capacity has been increased by about 12.5 per cent. And all of this expansion has been privately financed, even though about one-third of it was certified as necessary for national defense.

The expenditure during 1953 of $26

billion for new plant and equipment—an alltime record—imposes terrific financial responsibilities on our corporations. About one-half of the amount required will come from depreciation allowances. In general, these allowances are supposed to pay for the replacement of worn-out or obsolete equipment. Another $8 billion will be raised by corporations through new security issues and long-term mortgage loans. All together, depreciation allowances, security issues and long-term loans will provide about $21 billion. But this is still $5 billion short of the $26 billion needed for new plant and equipment this year. Thus, it is retained profits that spell the difference between expansion and standing still, between growth in the productive capacity of the economy and running downhill.

As plant facilities are expanded, corporations also need more working capital. A larger volume of business requires larger inventories, larger accounts receivable and larger amounts of ready cash to meet payrolls and bills for materials. The increase in these items during 1953 is estimated at $8.5 billion, of which about $2.5 billion will be supplied by short-term bank loans. The other $6 billion will come from retained profits. Thus, retained profits provide an essential $11 billion—$6 billion for working capital, $5 billion for new plant and equipment—to meet corporate financial requirements.

Incentive for Investment

The role of the profits that are paid to stockholders as dividends or to employees under profit-sharing plans is even more important than the role played by retained profits in providing plant, equipment and working capital. Dividend payments provide the main incentive for investment in the stocks of corporations. They are the reward for risks taken by investors. Dividends paid by corporations whose common stocks are listed on the New York Stock Exchange provide an average return of about 6.5% at present prices, and dividends on preferred stocks average about 4.5% return. Dividends are distributed among 6.5 million stockholders. Also, it is estimated that 3 million employees now are covered by profit-sharing plans. These plans increase the incentives of both production workers and managers to work harder and more efficiently.

Thus, more than 9 million Americans have a *direct* financial stake in corporate profits through ownership of stock or participation in profit-sharing plans. But *all* Americans share indirectly in the rewards of a successful business year. Investment of a major part of 1953 profits in new plants and equipment means more employment opportunities and better working conditions for labor. For the nation, it means new industrial capacity that is essential both for national defense and to produce more and better goods for a rising standard of living.

Corporate profits after taxes represent about 6% of the nation's total income. But the job they do to stimulate investment and to finance industrial expansion and improvement is more far-reaching and more essential to the prosperity and well-being of the American people than would be suggested by that small figure.

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get an extra-dirty repair job, the men working on it received a few cents extra per hour. Perhaps Al could do the same in regard to keeping Hanson happy. Pay him his regular rate for performing his regular work, then when his duties called for taking care of trainees, pay him his extra remuneration out of the contingency fund.

As my old friend used to say, "There's more than one way of skinning a cat!"

Robert S Alexander
Greenville, RI

THERE WAS A TIME when the foreman could deal with each individual. He could hire, fire, or hand out raises. He did not have job evaluation—a principle of seeing to it that there was some equalization of wages within the plant. He did not have merit rating, which a few years ago was considered something to hang yourself with.

We know that many individuals worry more about what others are getting than they do about their own pay check. That is one of the reasons we find ourselves thinking in terms of general feeling rather than dealing with the individual.

Many companies sign some kind of uniform application rule. Pretty soon the bugs appear, and we wonder what has come to pass. We find we don't have a policy to cover all the things that happen. We find that it is not engineering problems that bother us most—it is people. Personnel problems require quite a bit of study. It is wise to get a lawyer before putting them down in writing. Once you sign them, there they are, and you

"Typical inspector — all rejected but one — and can't admire it enough!"

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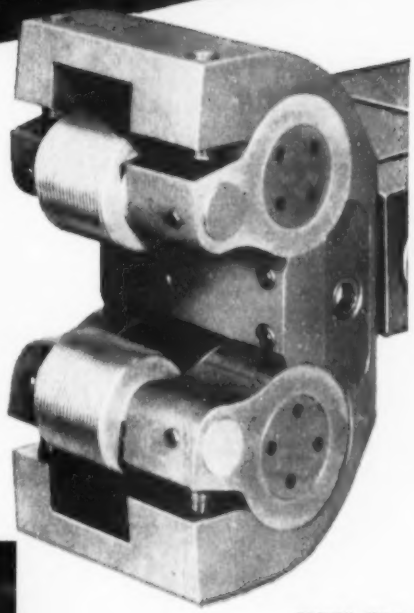

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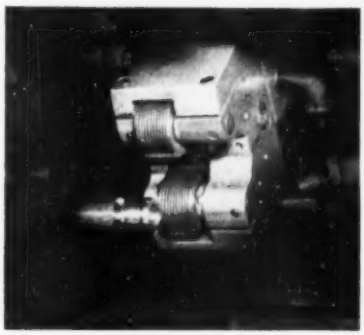

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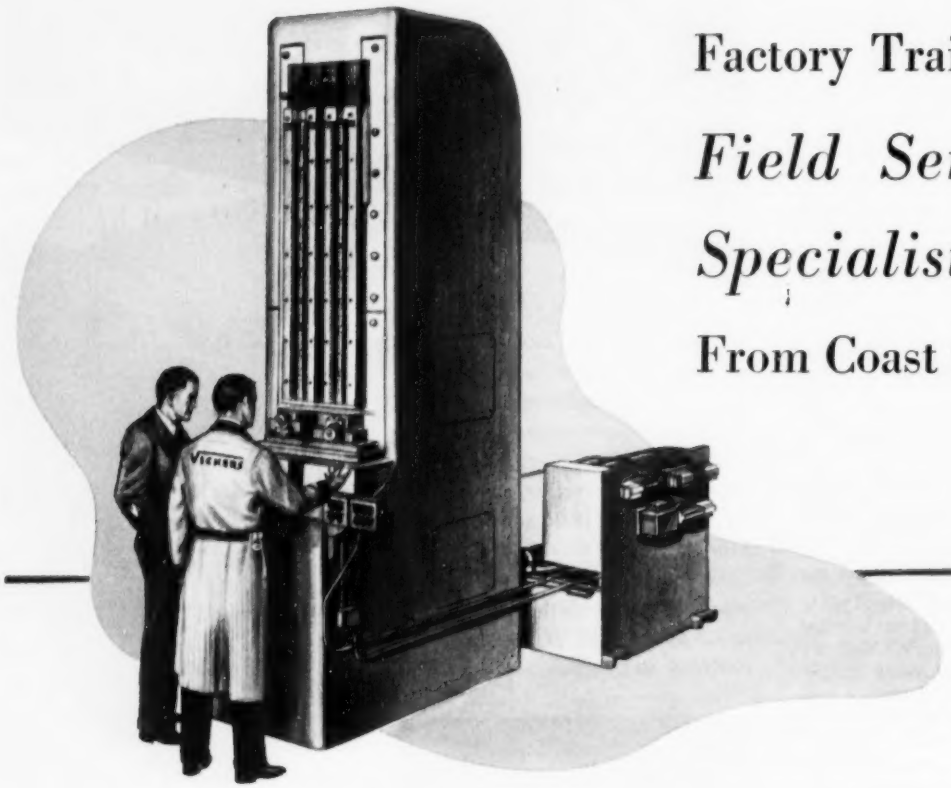

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must live up to them. In the case of "Portioning Out The Pie" we have a man who was hired for a specific skill and assigned to a definite job. He has done such a good job in every respect that the foreman assigns all the trainees to him. The workman does his regular job and, in addition, trains all the new men. Because of this he wants a raise.

In a case such as this you just don't tell a man off as Ed suggests. You certainly don't if you have a union. Someone has to listen to him on friendly terms. In this way we can often get him thinking along our lines. We must always keep in mind the fact that good friends do not always agree; their friendship endures because they know how to talk to each other.

Hanson is a good man, and the foreman has admitted he would hate to lose him. On the other hand, the foreman wants to give him a nickel more an hour, but knows if he does the other men will be on his neck for a raise. I believe there is a way out of this problem without causing resentment or discord in the department. Divide some of this training with other good men in the department. If this does not solve the problem, pay the man who does the training ten percent more during training period. He will then be well paid for this extra work but only for the time he is doing it.

A E Salmons
Philadelphia, Pa

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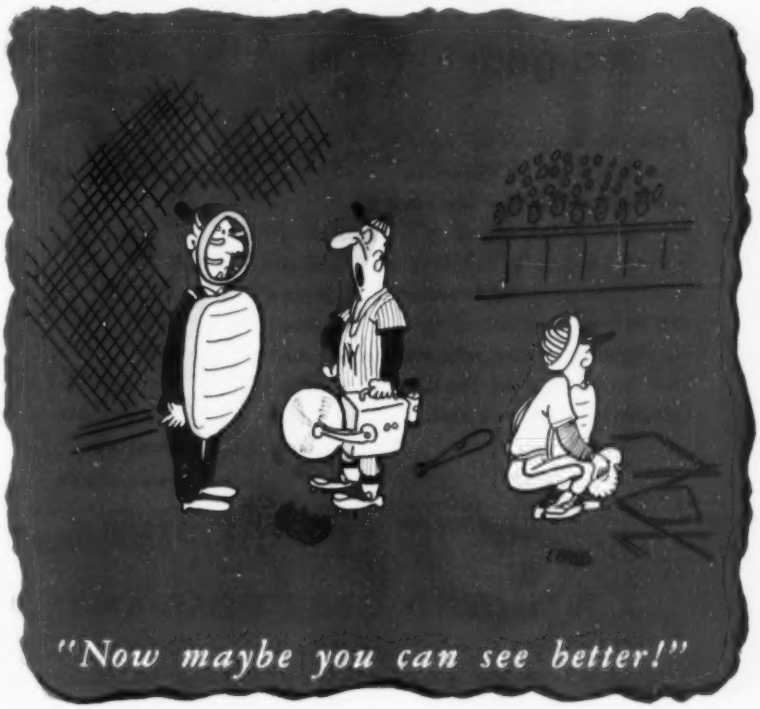

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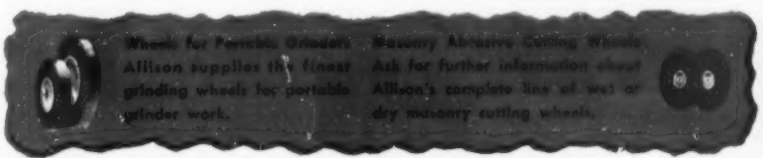
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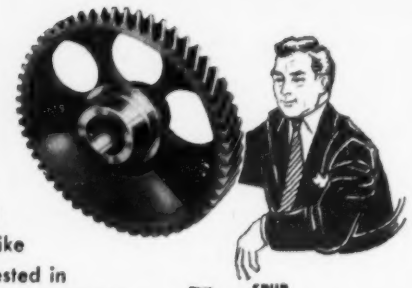

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stick to the plan with only slight modification.

The payment of wages has been a touchy subject over the years. Each one feels that he is equal to anyone else and should be so paid. With the strongly organized labor force which we must work with today, it becomes increasingly harder to just "butter up" a fellow for a good job done. This idea was used many years ago but must be discarded today. It is like trying to use a 1914 car and drive it down one of our main streets; we see the folly of this idea if we happen to be driving back of the old car.

Wages and wage payment are in the same class. They must be brought up to date in thinking and acting. So we go about the study in a systematic method.

Companies have made studies of conditions and methods of wage payment. Incentive systems of all types have sprung up. They have been carried right down to the sweeper. Yet the old story of base pay still seems to be the haunting factor. What is the job worth? The question often stumps both unions and management. The individual thinks little about what the job is worth, for the thinking here is, what can I get for the work —the more the merrier.

Some years ago job evaluation and job description were introduced into our industries, and, while this idea has not taken rapid growth, it is a sound approach. It is sound if it is correctly installed and all factors of each job are weighted properly. Too often a company is in a hurry to just put in a system, and does not want to spend the necessary money to properly install it. Then trouble arises, for jobs of equal complexity and effort have not been placed on an equal footing. Oh yes, they can be passed off as being harder or easier by changing certain individual factors, but a question still remains in the mind of the worker. The plan then slowly breaks up and it remains in name only.

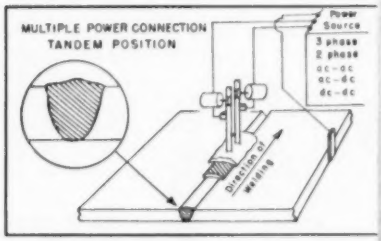
"This way the shop makes a little something the Saturday afternoons games are on."

CUT YOUR WELDING TIME IN HALF *with* UNIONMELT

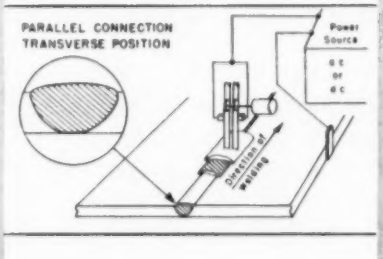
Multiple Electrode Welding

UNIONMELT Multiple Electrode welding with two or more electrodes in tandem, transverse, or other positions increases welding speeds up to three or four times faster than single electrode welding.

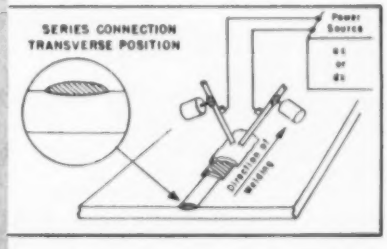
By using two or more electrodes in the same weld zone, magnetic reaction can be regulated to provide exceptional control over arc direction and weld shape.



Extra High-Speed Welds are made with multiple power connection and the electrodes in the tandem position. Speed is three to four times that of single electrode welding. This is particularly suited for welding long continuous seams, well-prepared and well-fitted, as in pipe, tanks, pressure vessels, and structural assemblies.



Extra Wide, High-Speed Welds are made with parallel power connection and the electrodes in the transverse position. Speed is twice as fast as for single electrode work. This is particularly useful for welding seams with gaps or other irregularities, as in center sills, ship plate, and heavy, hard-to-fit work.



Extra Shallow, Wide Welds are made with the series power connection and the electrodes in the transverse position. Speeds are many times faster than single electrode work and the dilution of the deposit is far lower than can be produced with a single electrode. This process will open new possibilities for surfacing and cladding all kinds of articles by automatic welding.

Complete UNIONMELT machines are available for multiple electrode welding and all UNIONMELT apparatus is designed for easy installation in any plant or factory. LINDE's engineers will be glad to determine how UNIONMELT Multiple Electrode Welding can best benefit you. Call your nearest LINDE office for more details on UNIONMELT Multiple Electrode Welding.

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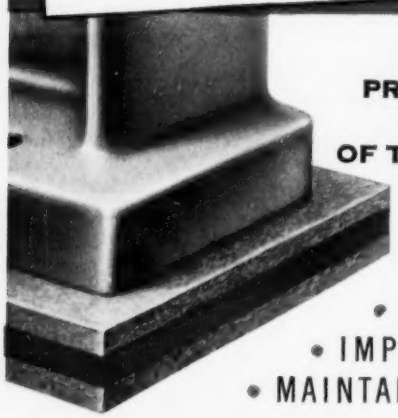

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And you do it without drilling floors, because you mount machines without bolts or lag screws when you use UNISORB. You simply cement the UNISORB pad to the machine base and the floor, let it set overnight, and the job is done. From the smallest grinder to the largest press, there is a grade of UNISORB to do the job right.

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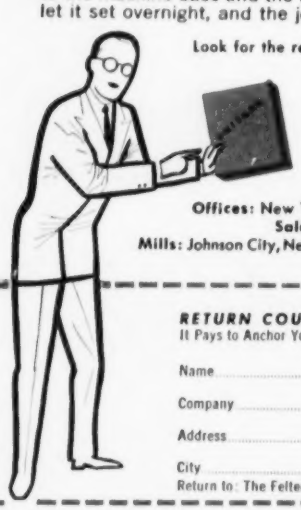
Look for the red center and UNISORB brand mark



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Job evaluation is not too complex, it only requires an understanding of the principle involved. Any plan or system must have a basic principle on which it is built. To make the idea work, the thorough knowledge of these fundamentals and facts must be understood. It can be said that perhaps too little is known of the underlying principle in job evaluation and, therefore, it tends to create a mystery. Maybe because most of the plans have been put into effect by industrial engineers and/or accounting firms, and too little time has been taken to actually train the users of the principle of the idea. However, a company should always know what it is buying and how to carry on the program without constant outside help.

Now, to come to Al's problem,—if he had job evaluation on Hanson's work he would not be faced with his present difficulty. Hanson is doing special work in training and, therefore, is supervising. Here we would pick up additional points for this work. The final total of Hanson's work would, therefore, rate him in a higher base rate group than the other workers. Hence he would be entitled to more money, and could get it without fuss or furor.

No foreman who has been properly schooled in job evaluation and job description ever feels that it is no good. Those who do not want to understand or want the good old days of "pay as you want to" will never think job evaluation has a place in his department. It is unfortunate that such thinking exists but again, we deal with humans.

Many good articles have been written on job evaluation and job description and it would be wise for all foremen and supervisors alike to read many of them. Don't try to make them all agree in all particulars, but take the best from each of them —

"McGeean, we've had our efficiency dept studying why production on your machine has been lagging . . . we've had experts in . . . we've had time studies made . . . finally we came to a conclusion . . . you're lazy!"

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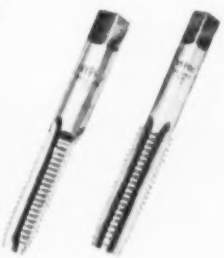

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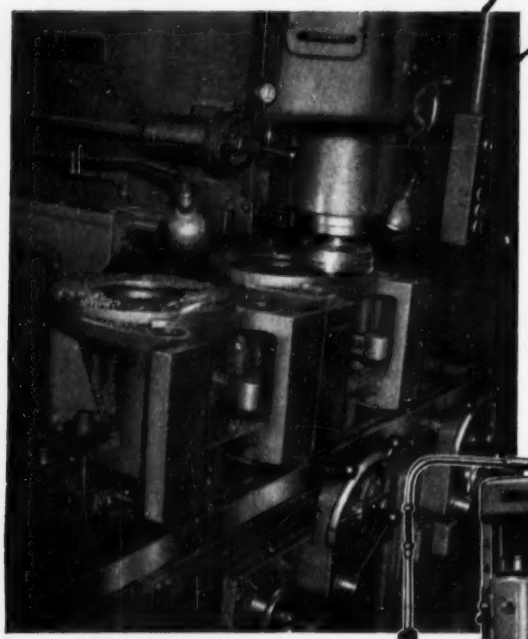
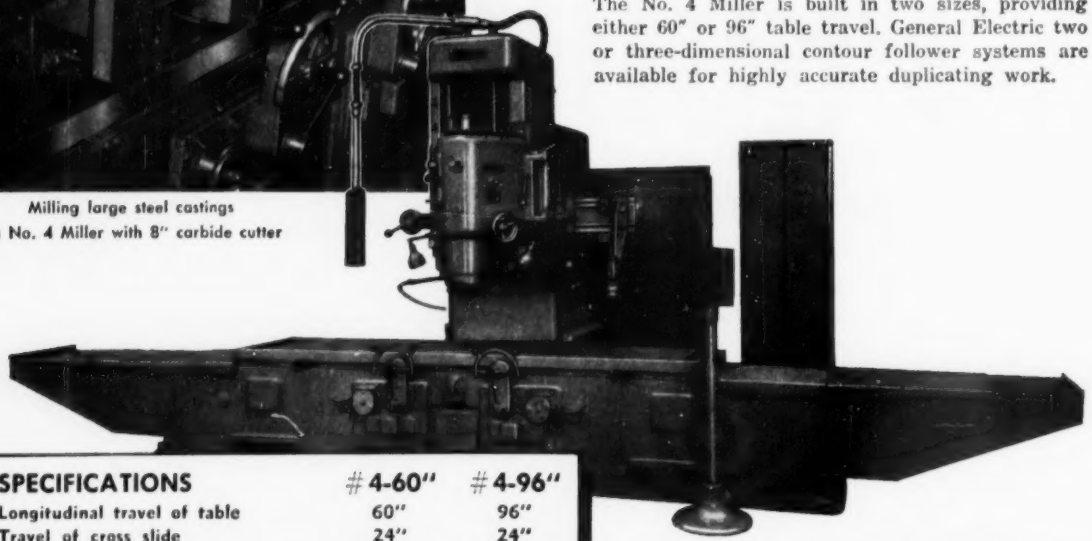
The Reed-Prentice No. 4 Vertical Miller easily handles heavy-duty milling operations like the job shown at left. Ruggedly constructed for rigidity and accuracy, this machine features infinitely variable electronic feed drive for table, cross slide and vertical slide.

The No. 4 Miller is built in two sizes, providing either 60" or 96" table travel. General Electric two or three-dimensional contour follower systems are available for highly accurate duplicating work.



Milling large steel castings on No. 4 Miller with 8" carbide cutter



Reed-Prentice 96" No. 4 "Electronic" Miller with two-dimensional General Electric contour follower unit

SPECIFICATIONS	#4-60"	#4-96"
Longitudinal travel of table	60"	96"
Travel of cross slide	24"	24"
Table working surface	24 x 96"	24 x 132"
Feed range	½ to 25" per minute	
Spindle speeds: 20 HP motor	45-1800 RPM	
25 or 30 HP motor	90-1800 RPM	

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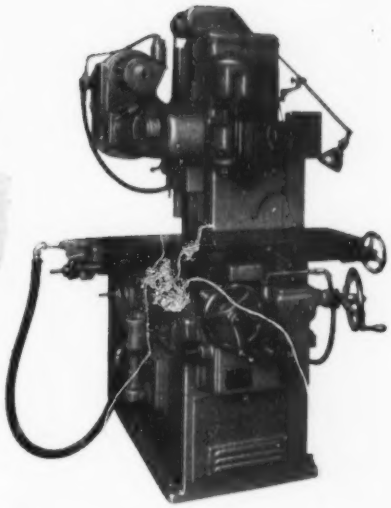
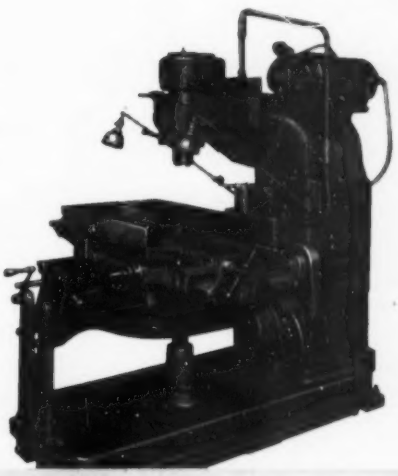


Universal Head 12V Vertical Miller

Reed-Prentice Machine Tools are profitable investments. Their versatility makes them equally valuable in toolroom or production work.

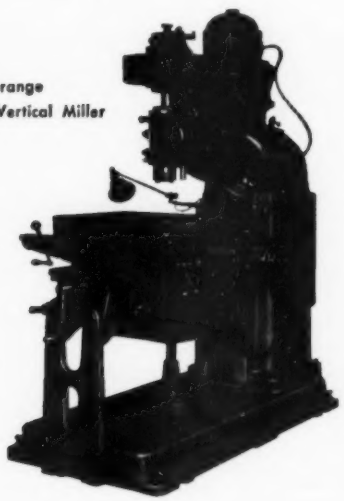
Model 22V and 22VS Vertical Millers provide a large 32 x 22" table and 30" throat depth. The 12V "Electronic" Miller has universal head adjustment, 46 x 12" table and can be supplied with electronic duplicating unit.

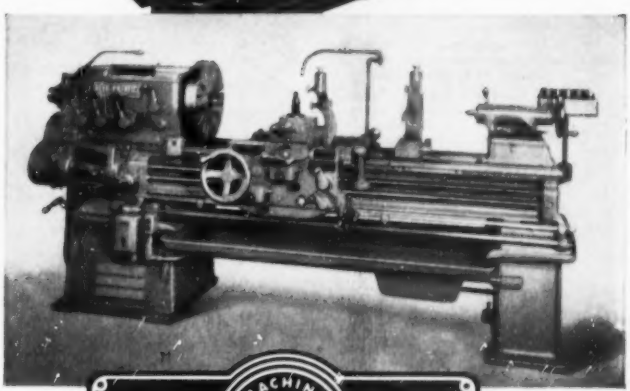
Reed-Prentice 14" and 16" Engine and Toolroom Lathes offer optional high spindle speeds to 1200 RPM for faster turning operations. Heavy-duty 20" Engine Lathe has 21½" swing over ways and 54" standard center distance.



Universal Head
22VS Vertical Miller

Wide-range
22V Vertical Miller





16" Toolroom
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the ideas and suggestions that will build for you a system best suited to your own organization. No system can be tailor-made and just taken over bodily for each and every company. Modifications and changes must be made to make the idea workable within each specific organization. It makes the system become an integral part of the company—and it should be.

Once a good job is done, the workers, the union, and all of management can get along better in dealing with each job and its worth. The actual hourly rate set for each job level is the company's right to determine. Naturally this is tempered by the union's desire. However, there is a structure to be properly carried out on the final base rate when job evaluation is in force.

Study up on the subject—it is an aid that will help you and your company grow.

Charles D Townsend
West Hartford, Conn

•

TOOLROOM OR SCHOOLROOM?

Is it risky to put a new man on a tough job, even though he is supposedly qualified by experience in other shops? Does learning by doing justify possible waste of time and materials?

APPARENTLY ED does not put too much stock in the old saying: "There's small choice in rotten apples." When a worker has a record of having fouled up a previous job, the foreman who chooses that man for another complex and difficult assignment is really taking a chance, especially if there is a better and

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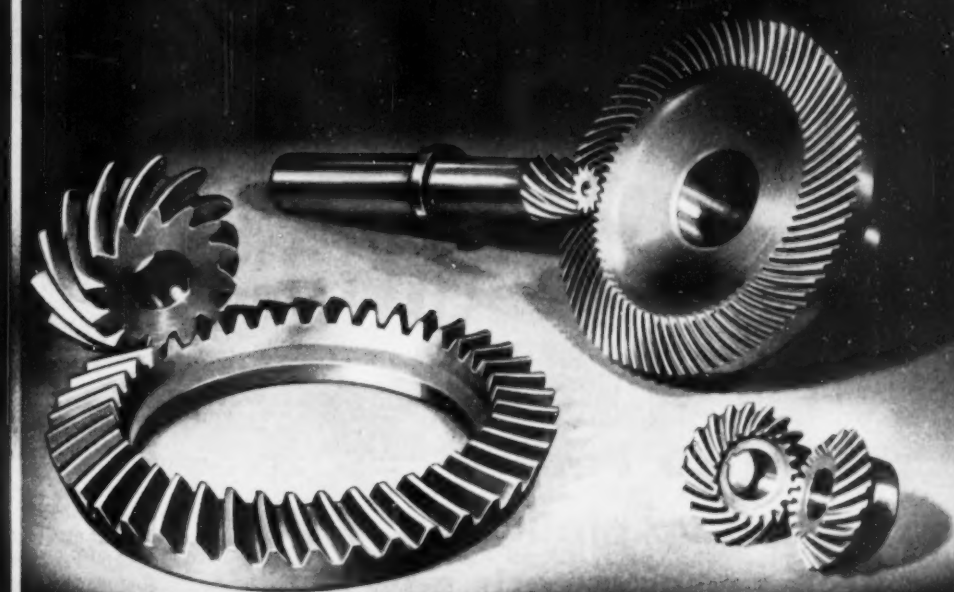

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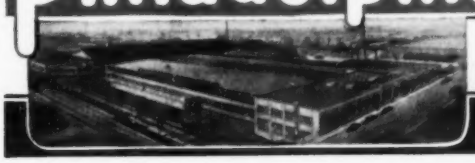

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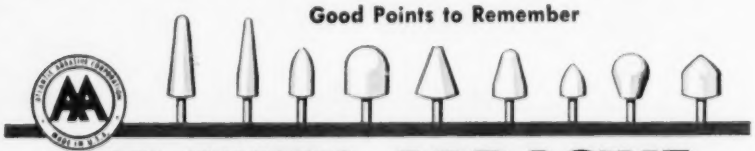
Third, by specifying NU-TEX Mounted Points, you eliminate costly shipping delays . . . choose from a complete line of wheel shapes . . . get prompt service on every order. Try them and see. *Don't* wait — send for descriptive folder now or, better yet, have our representative show you NU-TEX Mounted Points in action . . . saving time and money *on the job!* Atlantic Abrasive Corp., 516 Pearl St., South Braintree 85, Massachusetts.

Good Points to Remember



ATLANTIC ABRASIVE CORPORATION
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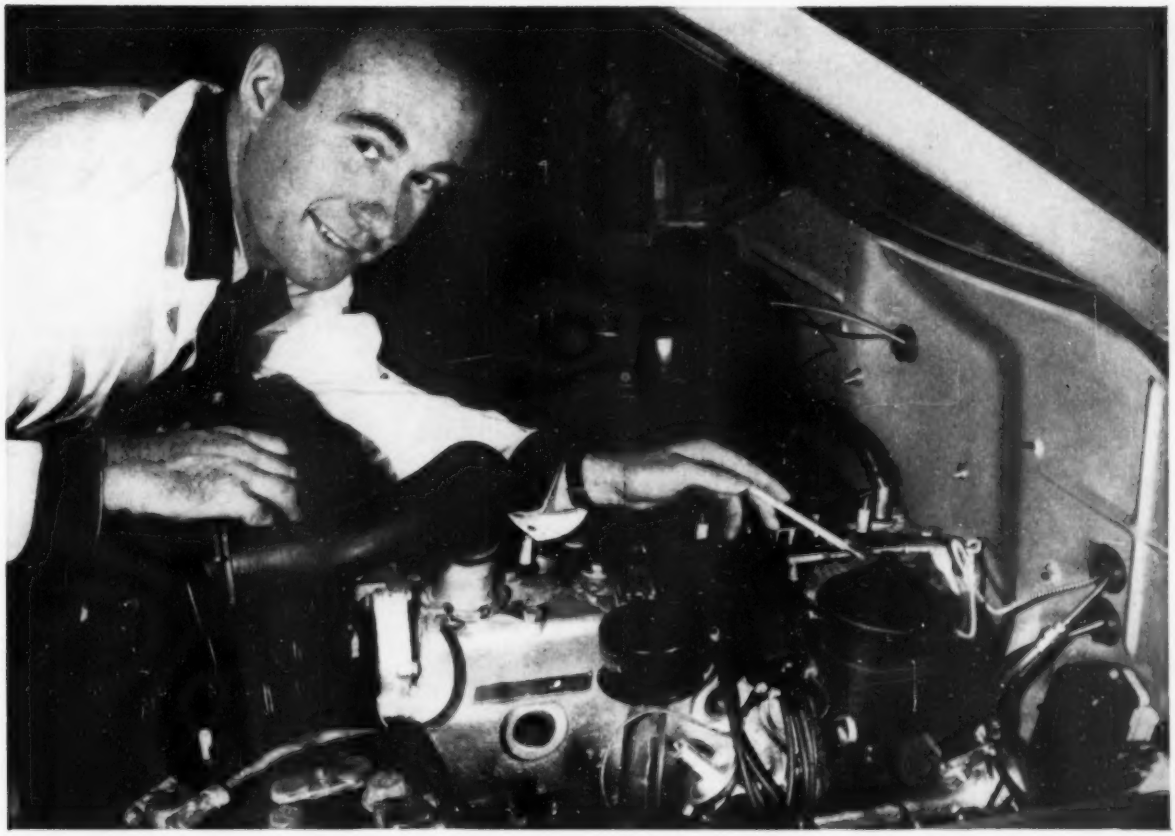
more experienced worker available. However, my hat is off to Ed for his confidence in the innate ability of Barrett. A foreman who trusts his men is trusted in turn by them. Confidence inspires the desire to make good on an assigned task. In Barrett's case I believe that Ed is justified in giving him the opportunity to use the company's time and material to learn and obtain the training and experience necessary to do that particular die job. Putting a man on his own and showing him that the foreman has confidence in his ability to lick a tough assignment is the best device for assuring the successful outcome of the job, and will aid in building a valuable employee.

There is only one fly in the ointment in Ed's reasoning that the best way to learn is by doing the work yourself. That is the necessity for properly starting off the trainee on the job and carefully supervising his work to see that he is on the beam. Of course it is recognized that there is a little schooling in every tough job, but there must be method in application of the schooling, else the worker will go off in some blind alley and the whole value of the training process will be lost.

Modern industry has come to realize in recent years that training responsibilities are inescapable. It is a continuing process; new employees must frequently be trained for specific jobs they are to perform, experienced employees require training to fit themselves for more responsible and difficult positions commanding higher pay and to prepare themselves for technological changes.

Any assignment that will permit the growth of skill, and develop ability to perform more difficult work, is worth the time and material, provided the trainee possess the preliminary basic requirements of education and background experience as a prerequisite to the advanced work. However, the foreman

". . . in charge of all small parts . . ."



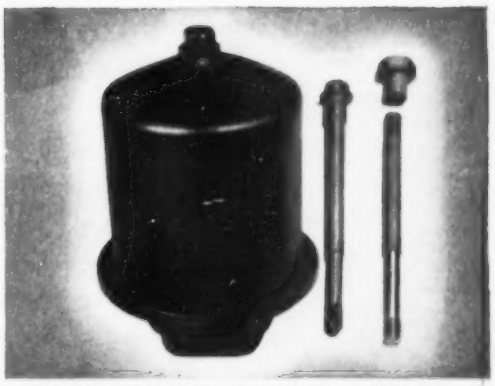
Here's where Purolator screened out rising costs

● Purolator makes oil filters for a prominent auto maker. They're top-notch filters that do a tough job well. Purolator and the car manufacturer are both proud of them.

Not long ago an RB&W "fastener engineer" got loose in the Purolator plant—just when company production executives were looking for a way to lick rising costs. He noticed that the Purolator filter was being assembled with a two-piece fastener made slowly and laboriously on a screw machine.

Our man told the Purolator people about RB&W's batteries of cold-forming machines. Purolator wanted to know more. Now their filter is assembled with a one-piece RB&W fastener that costs far less to make and assemble.

Chances are you can find a stage in your operations where RB&W "fastener engineering" can help you keep costs in line. As a leading manufacturer of all kinds of fasteners, we're always able to recommend and supply the right ones for all your needs. Write RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY, Port Chester, N. Y.



EASIER, FASTER ASSEMBLY undercut high costs when Purolator switched from a two-piece fastener *(right)* to an RB&W-designed cold-formed fastener *(left)* for its famous oil filter.

RB & W

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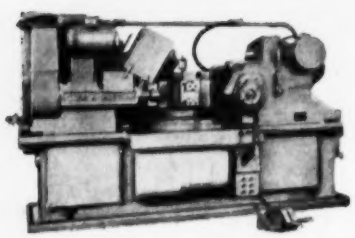

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The basic "1-2-3" method—exclusive with Goss & DeLeeuw—provides for gripping work in the chuck and machining all ends either simultaneously or in sequence. By eliminating several handlings and set-ups, the "1-2-3" method produces finished pieces at a fraction of the time and cost ordinarily required.

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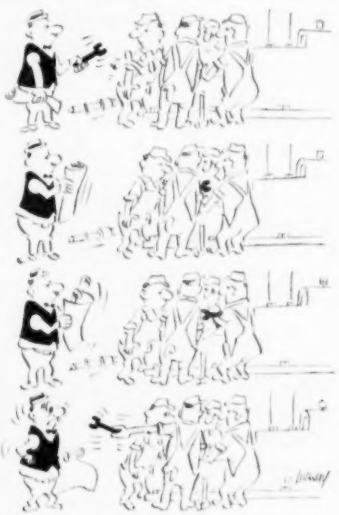
MACHINE COMPANY, *KENSINGTON, CONN., U.S.A.*

is the best judge of the choice of trainee to be given the advanced training.

Today's shops require trained men, and today's industrial leaders realize that the size of the shop has no bearing on the need for training in the plant. Training for both worker and foreman has many objectives. It is undertaken to help employees in self-development, to improve job performance, to reduce waste, to prevent absenteeism and tardiness, to reduce accidents and labor turnover, to speed adaptation and adjustment to new assignments, to reduce costs of supervision and overhead, to prevent grievances, to improve supervision and administration, and, in general, to assist in making for effective teamwork. There is no better morale and efficiency builder than the realization by the worker that the company is providing training as a means of facilitating his upgrading and promotion from within.

Al is wrong in accusing Ed of running a training school because of his decision to give Barrett the opportunity to tackle a job that has good training possibilities for skilled diemaking. The foreman who thinks along the lines that there is always a chance to learn something in any job, how to do it better, faster, more accurately, is the more progressive and valuable supervisor. The worker's value to the company increases in direct ratio to the foreman's value as a teacher and leader.

In my opinion, the foreman who participates in job training of his men is carrying out an important function of his position. In such training the message the foreman should carry to the trainee is essentially: "This is how to do the



When Byron Nelson stepped aside...

he revealed an interesting thing* about famous MacGregor irons

Byron Nelson, left, inspects finished golf club heads in the MacGregor Sports Products Inc. plant at Cincinnati, Ohio. He's near one of the machines that is used in making the irons. It's called a broaching machine and at the time the picture was taken it had finished more than 145,000 heads.

When Byron Nelson stepped aside he revealed a large drum of Pure Oil's Koolkut S-7—the superior cutting oil used at MacGregor in this broaching operation. Because the clubs are made of tough stainless steel forgings, the broach bar takes a terrific beating.

*Interesting to everyone with metal-working problems

Pure Oil's KOOLKUT S-7 is a star-performer, too!

Metal-working operations that save the most time are often the toughest on tools—surface broaching, for example.

The right cutting oil is one of the most important factors; and they know that, at MacGregor. So they use Koolkut S-7 and stretch the life of all broach bars.

One of the great things about Koolkut S-7 is its *multi-purpose* quality—making it perform extremely well on light as well as heavy operations.

Pure Oil specializes in *high-quality multi-purpose lubricants*—oils and greases designed to do several different jobs equally well. *To help you reduce inventory, simplify procedure, and minimize waste and error.*

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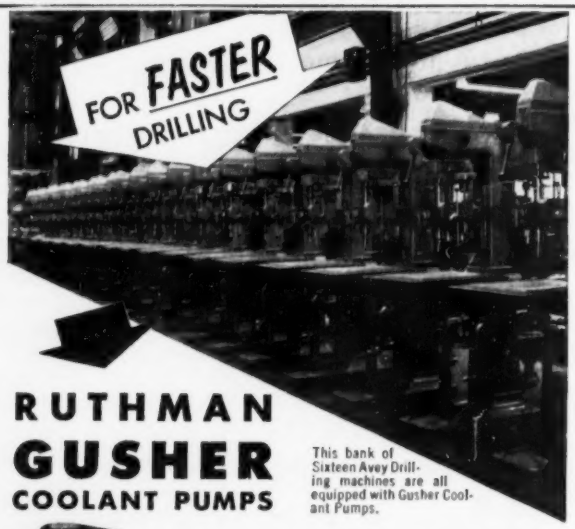

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In choosing a coolant pump for your metal cutting machinery it pays to standardize on the *best*, a Ruthman Gusher Coolant Pump. Leading machine tool manufacturers have learned by experience that Gusher Coolant Pumps are precision built to give better service, and greater production. That's why so many of them use Gusher Pumps exclusively on their machines.

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1818 Reading Road, Cincinnati, Ohio

job." From the standpoint of the trainee, the training he is getting answers a question in which he is personally interested—how to make good on his job. Even though a man is rated for his job, training should never stop. Learning to do a more difficult job lends zest and interest to any type of work.

In giving Barrett the opportunity to tackle the difficult die job, Ed is actually building up his reserve of skilled workers. However, I believe that Ed should guide and advise Barrett but should allow him to learn the job by doing it himself. The experience that Barrett gains should be tempered by the sage counsel and experience of the foreman. It is a good idea to avoid pressure to get out the job in a hurry.

When jobs to be performed require extensive trade knowledge and skill, training must be correspondingly complicated. Skilled jobs — typified by those of the tool and diemaker, require craftsmen. They not only have to acquire skill that can best be attained by extensive experience, they must also have a thorough knowledge of the tools and materials with which they work. The machinist, for example, as distinguished from the machine operator, must be an expert with a wide variety of complicated machines,— lathes, milling machines, drills, and others, and he must also know the characteristics of the metals with which he may work. He must know how to use numerous gages and measuring instruments. He must be able to work to close tolerances. In some measure, his trade knowledge is of a type that may be gained from demonstrations and books. In part, however, knowledge and the skill with which to apply it must be acquired by long experience.

"Can't spare 'em a second and we gotta keep 'em in shape."

Ed may not be running a training school in the toolroom, but he should realize that stipulated and fixed periods of time for learning cannot be applied on an over-all basis without resulting in inefficiency. Some persons learn much more rapidly than others. Moreover, individuals show great differences in their learning speed as applied to different types of learning. His training for Barrett should make allowances for this variability. Ed is giving Barrett the motivation that is necessary to make the training effective. He is encouraging Barrett to get the specialized experience that will fit him for the particular work in Ed's department. However, Ed can help Barrett attain maximum results from the assignment by personalizing the training procedure—bringing him into discussion of problems he may encounter, thus making his participation active rather than passive. Ed is right in permitting Barrett to go ahead on his own, but frequent observations by the foreman is still a necessity.

The subject of schoolroom in the toolroom is in line with recent management thinking about versatility training. Increasingly, industries are recognizing the value of having employees who can perform more than one skill. Versatile operators are valuable assets during both rush periods and periods when work is dull. Very often a specialist has to be laid off during a dull period, but the versatile operator can be shifted to new work.

The problem of changing job requirements is ever present; industry is constantly seeking better, more efficient, and cheaper methods of turning out its products and services. New machinery and new methods are being developed and are being adopted as quickly as management can be convinced of potential savings through their use. Unfortunately, every such change means a greater or lesser period of training for the

"If you'd do less fork lifting at home perhaps you would lose some weight!"

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POWER BLADE

and here's why . . .

BLADE IS STRAIGHT, FLAT . . .
without dish or bow, and . . . a blade must be straight to cut straight.

TEETH ARE SHARP . . .
Milford "Multiple-Pass" Milling assures sharper, more uniform teeth with smoother gullets, and it takes a sharp saw to cut really clean and fast.

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M-2 HIGH SPEED STEEL . . .
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gives a high Rockwell hardness that means a longer blade life cutting harder metals . . . plus a fine grain structure that prevents tooth chipping or crumbling under pressure.

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that you can't buy a better blade anywhere than a MILFORD All-Hard REZISTOR. TRY ONE on your own tough jobs in your own shop and SEE FOR YOURSELF!

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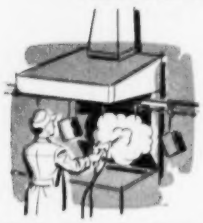
...and get a better paint job, too? Check the RANSBURG Processes!



Let's say you're a manufacturer of some painted product. Size and shape aren't too important. You're already using a conveyorized set-up, but you want a better quality finish . . . increased production . . . at less cost.

You've heard about electrostatic spray and some of the phenomenal results being achieved by Ransburg on other production lines. You write or call . . . say you want to know what Electro-Spray painting can do for YOU.

Ransburg engineers will help you investigate the possibilities. They'll gather complete data on your present operation, and check your facilities and requirements. If Electro-Spray is feasible, you will send samples of your unpainted products—with paint—to the Ransburg laboratories in Indianapolis. The labs are completely equipped, and the Ransburg engineers and technicians have every facility at their disposal for conducting extensive tests, simulating your production conditions.

After the priliminary studies and tests, you are invited to see your job run in the Ransburg Labs. There's no guesswork. You'll see the actual results. Paint and labor savings are determined. You can check the improved, uniform quality, and you'll be furnished drawings, showing the proposed installation for your own plant.

ALL OF THIS WITHOUT OBLIGATION TO YOU!

After the Electro-Spray equipment is installed, Ransburg will continue to work with your finishing department. Ransburg engineers—men skilled in electrostatic spray painting—are always available to work with you on any problem which might arise in your finishing department. Fair enough? Let us hear from you.

RANSBURG

Ransburg ELECTRO-COATING CORP.

INDIANAPOLIS 7, INDIANA

personnel who are to use the new methods or operate the new machines. Employers must plan this training to precede the introduction of the new work requirements, or efficiency will suffer.

Ed has hit the nail on the head with his exposition of an old axiom of learning: the best way to learn is by doing the work yourself, not watching someone else do it. The development, through practice, of the ability to manipulate the tools of one's trade and to perform the given task with minimum lost time and effort and minimum waste and spoilage of material or product can only come with constant and steady application.

Ed is on his way to develop another Miller in his department. He is to be commended for his understanding of good foremanship and demonstration of confidence in his workers.

Mark Twain once said: "Training is everything. The peach was once a bitter almond; cauliflower is nothing but cabbage with a college education."

For the good of both worker and management there should be a little of the schoolroom in every toolroom. "It is always in season for men to learn."

Harry Kaufman
Philadelphia, Pa

•

SALARY NO SECRET

Should a man's earnings be his private business? Will public knowledge of each worker's wages quiet curiosity or tend to arouse resentment among the men? Some readers say . . .

THERE WAS A TIME when a boss tried to pay his men as little as he could. Every man had a different wage scale, and he bargained with each separately. If he could not hold a man any longer because of not paying him enough, he raised his pay. You can't do that these days.

I went to a shop once to work as a diemaker. When I asked about the pay, I was told to start work and they would see what I could do. After the first day they were satisfied with my work, but they still wouldn't tell me what they would pay me until I had worked a week. After the week was up they handed me $5 which I refused to accept, claiming that if I was not worth more, I was not worth that much. Finally they gave me $6 with the understanding that the following week it would be $15. After that

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80 complete pieces per minute

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Here is low-cost, completely automatic production . . . typical of precision stamping that can be performed on the Baird Multiple Transfer Press.

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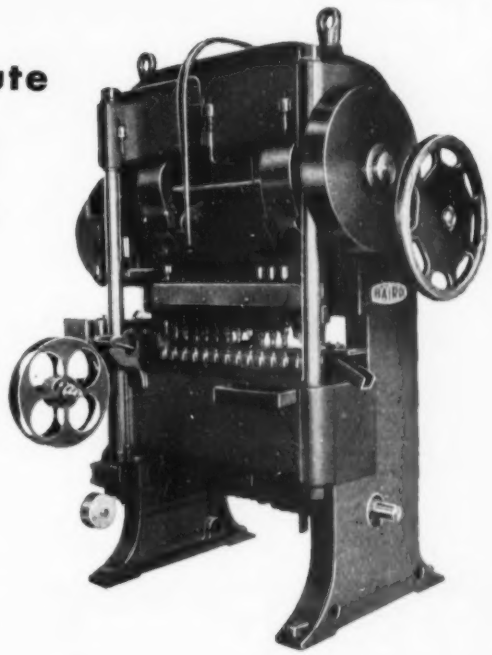
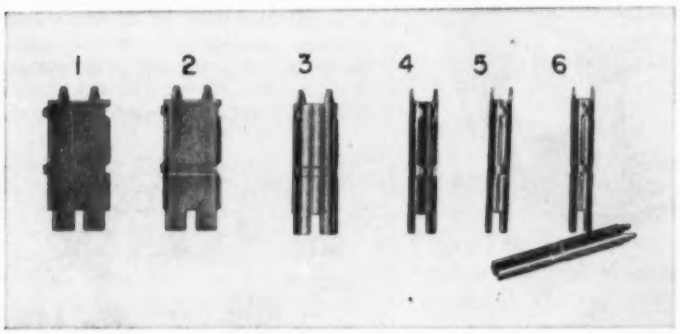
There are 12 press sizes, taking automatically-fed coiled stock from 2½" to 4"; maximum feed length from 2" to 3½". For low-cost, volume production within its range, there's no more profitable automatic than the Baird Transfer Press. Bulletin on request.



BAIRD AUTOMATIC TRANSFER PRESS

Producing an electrical switch part

Here is a hollow shaft, used in an electrical switch, that is produced completely in a 6-station die set. At station No. 1, the part is blanked from flat stock. At No. 2, the outer edges are curled . . . and the remainder of the forming operations take place at stations No. 3, 4 and 5. Final sizing is performed at No. 6. This shaft is made in different lengths and variations, by means of interchangeable punches and dies. Production, 80 pieces per minute . . . 4800 per hour.



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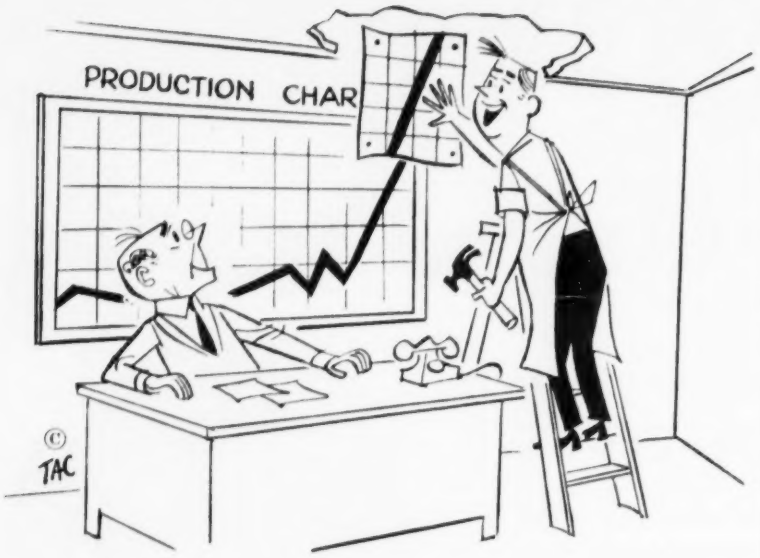

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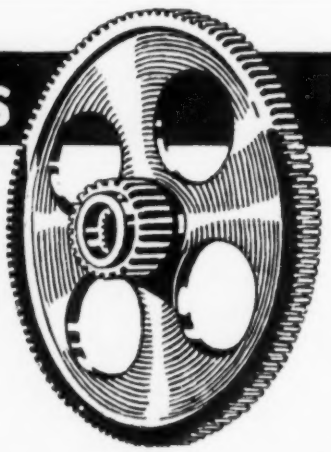

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G&T

Massachusetts Gear & Tool Co.
WOBURN, MASS.

week I demanded $25, and I got it. The other men were getting $18 because they needed the job more than I did, or they were afraid to ask for more. That does not apply nowadays. Now every manufacturing place has a wage scale, partly because of unions, or, like everything else, it has become standardized. It is up to the man to show his ability to do the work that pays the rate.

Every job has its rate, or many rates, depending on the job. A carpenter will be only a man who can cut a board, or nail a piece of wood. He will not expect to get paid as much as a cabinet maker. A machinist who operates a drillpress will not expect to receive the same pay as a turret-lathe operator who sets up his own machine. There are scales of wages in every line, and it is a source of satisfaction to a man to start learning a trade and climb to the top, if he has the ability.

Wage classifications provide an incentive. For the shop it is a good thing for many reasons. It reduces wasteful speculation in a man's mind; he doesn't have to guess what John Brown is getting paid. When rates are open knowledge, a man will not be envious if another worker is being paid more; he will realize that the other worker is better qualified than he is.

In our shop when we needed a man in a higher bracket, we gave the first choice to the men in the shop. I selected a job and gave it to the men who wanted the job. When they finished, the work was examined by two inspectors at different times, and the report given to me. I knew the times when the job was started and when it was finished. The man who was doing the job knew it, too. The man who qualified got the job; everyone knew

"I thought you said yesterday you wasn't going to speak to me about loafing again."

that he would receive more pay. If more than one qualified, seniority was the ruling factor.

Ability, production results, being on the ball all the time, are things that count in getting to the top pay bracket. Whether it is in the shop, or a supervisory job, it is only fair to base wages paid on the performance of the job.

There are places where a man is paid not for what he knows, but by who he knows in the shop organization. That is bad practice not only for the corporation, but for everyone in it, as there cannot be cooperation because of jealousy and envy; it is unfair to everyone concerned. Nothing is resented more in a shop than when there is a favorite or a pet who is drawing more pay than the others, not because he knows his job, but because he knows the higher-ups.

Give notice that more money will be paid to the man who can produce more and better work. The men will look up to good craftsmanship, and try to step up to his level.

By having rates of different jobs known, and when vacancies occur, it is made known to the rest of the gang, or notice posted, everyone will be able to see it and will have a chance at it if they qualify, and no favoritism is shown. In such a shop all will work in harmony; snooping or prying into the other man's affairs will have no place there.

Michael Axler
Los Angeles, Calif

•

CRAZY NUMBERS

Are detailed cost reports of specific value to the busy foreman or will he tend to ignore them as a waste of his valuable production time? How can they be best presented?

THE INFORMATION given by cost sheets is only valuable when properly interpreted. Few foremen have the necessary time to do this without neglecting other duties.

Cost sheets are not valuable in themselves, but only the deductions which can be made therefrom. The deductions which a foreman should know should be worked out by the cost department. This report should accompany the cost sheet.

If the foreman requires additional information, it should be given by the cost department; it should not be necessary for the foreman to work out costs himself.

W E Warner
Essex, England

ARMSTRONG

MORE TOOLS
per man for
MORE PROFITS!

Even when labor was cheap and tools were costly, it was the best tooled shops that prospered. Now with wages higher and the work days shorter, it becomes imperative that every worker be supplied with every tool that will increase his hourly production.

See that each lathe, planer and shaper operator has the correct ARMSTRONG TOOL HOLDERS for each operation he performs. Equip each machine with its full complement of ARMSTRONG Setting-up Tools. Use better balanced, handier ARMSTRONG WRENCHES on machines and assembly lines. Specify ARMSTRONG Drop Forged "C" Clamps and Lathe Dogs . . . Today, only quality tools can be truly economical.

Write for an ARMSTRONG Catalog. It has page after page of production-increasing, cost-cutting tools.

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Armstrong Tools are Stocked by Industrial Distributors

Here's Good News for

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MX

is now available in OPEN HEARTH as well as BESSEMER

screw machine operators

The fact has been amply demonstrated that you can produce more parts per hour, that you can prolong tool life, minimize rejections, readily hold to tolerances and obtain better part finish by using MX screw stock.

In the past three years, the hundreds of shops that have put this faster-cutting bar stock into production have proved that MX will reduce the cost of *any* part by out-performing ordinary screw stock.

Such cost savings have averaged between 10 and 15%, sometimes ran as high as 40%. Today, you can confidently count on still bigger savings by using this steel.

And make a note of this. Now MX is also being produced in our Open Hearths to give screw machine operators a freer-cutting steel of the C-12XX type. This steel, especially controlled to improve cold-drawing characteristics, assures users of a fast-cutting bar stock not only of *excellent* surface quality but one that performs exceptionally well when finish-machined parts must be subjected to crimping or other deforming operations.

U·S·S Free-Machining MX—either Open Hearth or Bessemer—is available in all the popular bar sections and sizes. You can obtain it in cold-finished form from your regular supplier as "MX" or under his own identifying trade name. In hot rolled form, MX is available direct through our nearest district sales office.

USS

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UNITED STATES STEEL

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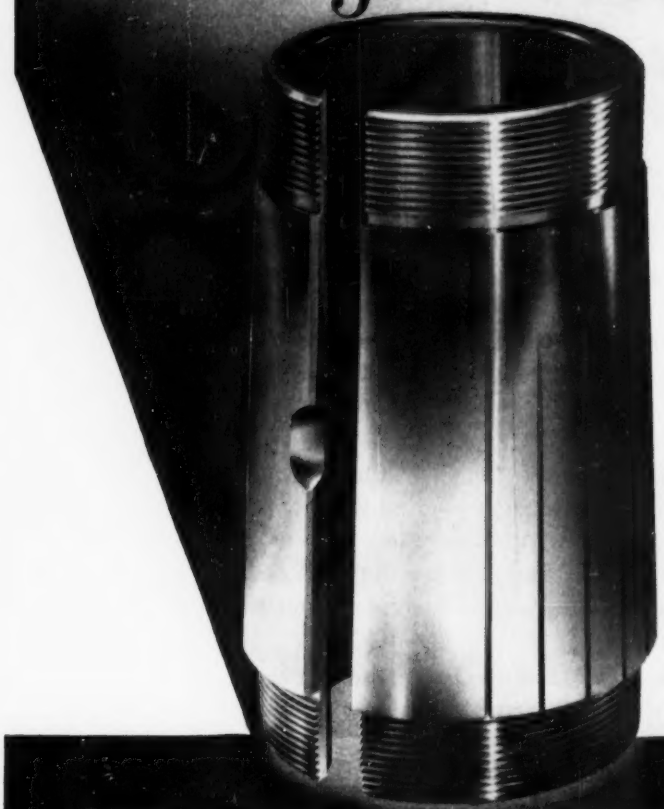
Enduring Precision



This spindle bearing is standard equipment on spindles designed by a world-famous builder of precision grinders. For extreme accuracy, for freedom from vibration, and for enduring precision, only sleeve bearings will do. Where other types of bearings retain their accuracy only for months, Bunting Spindle Bearings endure for years. Where other complex types require a surgical standard of cleanliness and a watchmaker's skill for replacement, the Bunting Sleeve Bearing requires only common-sense and the services of a good mechanic.

The secret of this performance and long life lies in the film type of lubrication. A properly designed and well lubricated sleeve bearing need not acknowledge any superior. No other bearing type possesses its simplicity, its ruggedness, its ability to deliver accurate work for many years. These attributes are possessed by the sleeve bearing.

Bunting engineers are at your service whether your problem is a precision grinder spindle or something of more, or of less, exacting requirements.

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BRONZE BEARINGS • BUSHINGS • PRECISION BRONZE BARS

OR, THE UNWIELDY PRACTICE of sifting the haystack for a needle which may or may not have been lost. It is good, of course, to find a lost needle, but why hide it?

Does the office guy just do sums and send them to the Als for them to see if there is anything of interest as a kind of Chinese puzzle? Or does he not compare actual with estimated cost and send warnings to the Als that times taken or costs incurred on specified operations or pieces are greater than that allowed in the price, or that money on a given contract appears to be being spent far faster than the proportion of work done seems to justify. If he does not seem to do this, he would seem to be just doing sums, or setting puzzles.

It ought not to be overlooked that costs cannot be other than historical, dealing with the past, but this is not to decry their value. Prepared so that they are useful, and presented with intelligence, costs and the cost clerk can be a foreman's good friends, but at best, they can but indicate past facts and recent trends, and, like a railway signal at "Caution" or "Danger," point the need for care.

In the absence of cost statements, however, the foreman in his job ought not to be like a ship without a rudder. If a foreman is fit for, and on top of his job, he ought not to need the cost clerk to hold his hand. If the right methods and machines had been used, the pieces correctly finished, with not more than a normal amount of scrap, and jobs had been done in the times estimated and the appropriate time rates used, foremen should not need to worry about cost statements — whether concise and intelligible or muddled and abstruse. Rather, if cost figures were presented which appeared to indicate that production was too expensive, an efficient, well-informed foreman may, with quiet confidence, ask

"Did you ever see a guy so wrapped up in his work?"

for a check on estimate or cost figures.

Far too long have the shops been the Cinderellas of the piece — the glass slipper fitting them at least as well as her sisters of the estimating and cost departments. In fact, the shops have been saddled with some of the errors of the said sisters. The writer once ventured to suggest to a critical director that a fault in the shops was treated as a crime—in the offices, as an "act of God."

P E James
Lincoln, England

•

COFFEE BROKE

Does the coffee break tend to increase or break down shop morale? Should the tendency of some workers to take advantage of the allotted time warrant elimination of the practice entirely?

BOB WAS HOT UNDER THE COLLAR when he came home last night.

"What's come over you?" I asked.

"Ah, these guys make me sick lolling around when they should be on the job working. What gripes me is that we are on a profit-sharing scheme down at the plant whereby we can draw fifteen or more percent of our yearly earnings at the end of the year and these punks do what they can to interfere with our interest."

Come to think of it, I don't blame the old boy one bit for feeling upset. What kind of mentality do these loafers possess when they know full well that what they do will affect the earning power of each employee through the earning power of the company?

If you don't mind this coming from a girl who has spent some time in a production plant, I want to say that it is my opinion that something should be done by the conscientious workers, in all fairness to themselves and the firm they work for, to lend pressure to bear on the guilty ones who, by their actions, become detrimental to the whole. We cannot be governed by the shiftless minority, any more in manufacturing procedure than we can in the political field, by letting them influence us in habits detrimental and dishonorable. By letting the dishonest employees influence us we are submitting to their will.

Bob has always been one who strived to do a fair day's work in return for what was paid him and he hates like the dickens to see some of the men follow in the wake of the timekiller just because they are afraid of what that type will think

NILSON

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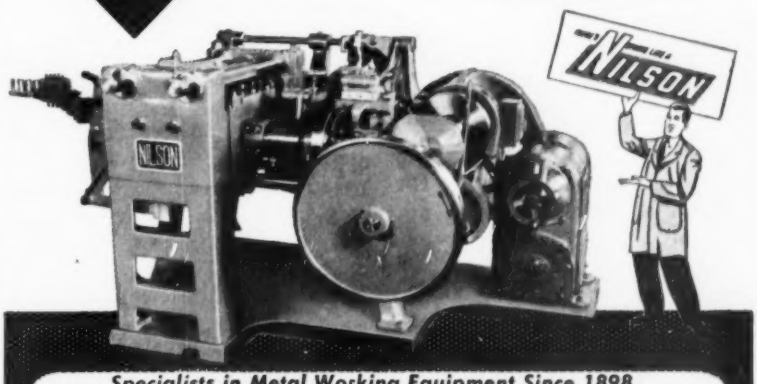
Wire and Ribbon Metal
FORMING MACHINES

. . . . for more efficient production of wire forms and small metal stampings requiring swaging, piercing, stamping, blanking or coining and forming.

The NILSON S-F series and Heavy Duty Toggle Machines (shown below) feature a Horizontal Press in Combination with Four Forming Slides . . . . a combination that provides maximum tooling flexibility — lower die costs with shorter set-up time.

NILSON FORMING MACHINES available in a wide range of sizes to form wire 1/32" to ½" diameters and up to 3½" wide ribbon stock.

For specific recommendations, send prints or samples of your operation, when requesting bulletin.



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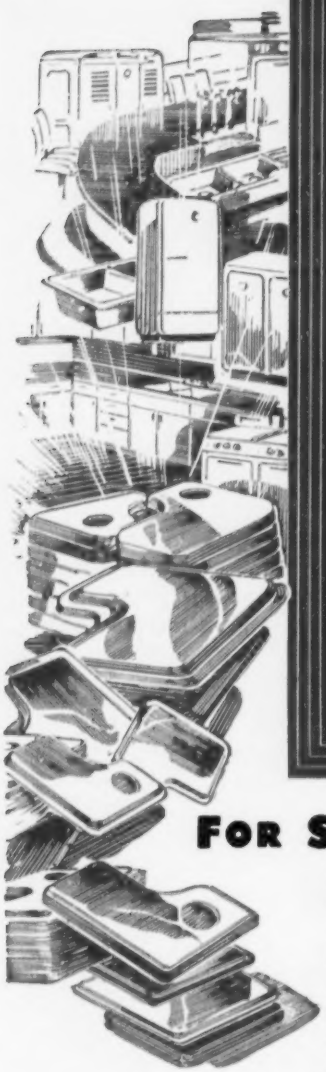

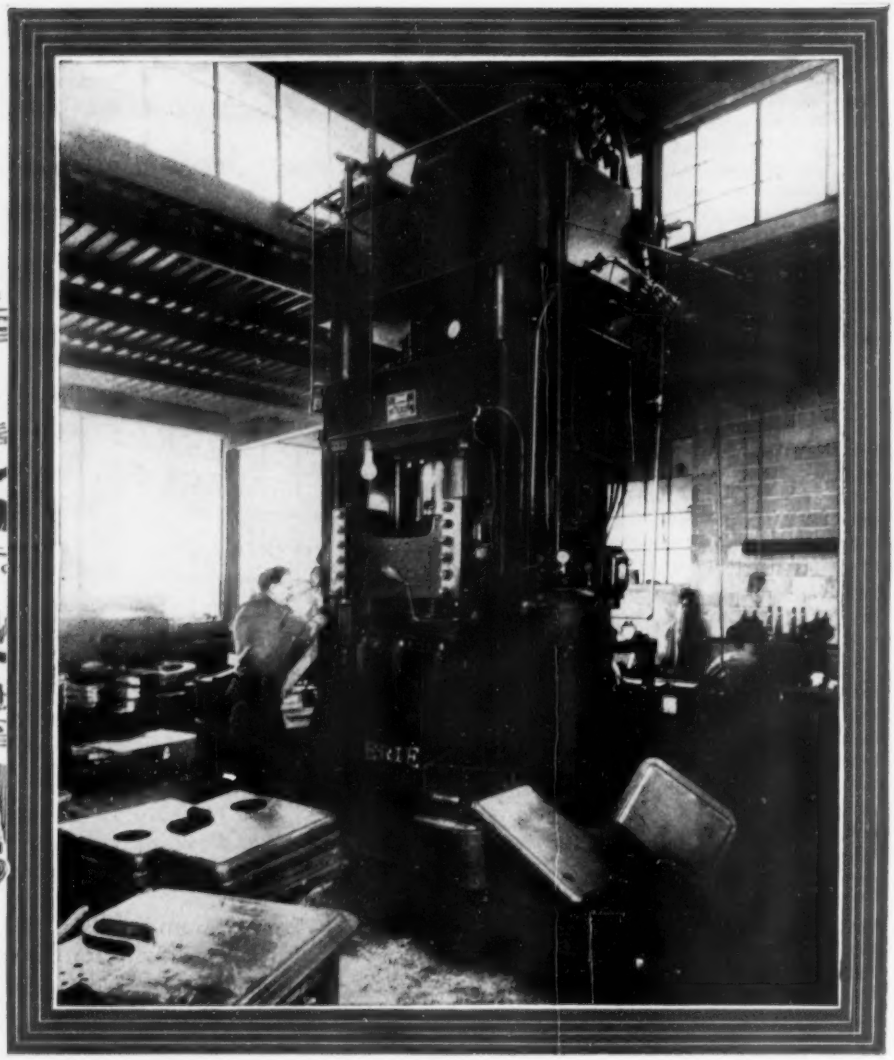

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TYPICAL of many Hydraulic Presses built to customer specifications by Erie Foundry Company is this 500 ton metal forming press operating in the plant of a large eastern manufacturer. The importance of sound design and rugged construction becomes equally evident on production cost sheets whether the equipment is highly specialized or standard. For this practical reason special precision hydraulic presses by Erie Foundry Company are widely preferred. You are assured of the results you want when you take advantage of the half century of experience represented in Erie Foundry Company presses. Write for bulletin 350.

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NEW ENGLAND
G. V. Eads, Kent, Conn.

of them. He said to me that if all fair-minded fellows would act individually, they could rectify the damage being done by those who are taking advantage of the coffee time. It shouldn't be necessary for a foreman to stand over the men to see that they start work when they should. It should be up to the men themselves because, as I see it, the reward is their's if the company prospers.

Where Bob works they have a sort of bonus system whereby they are given a certain percentage of their earnings based upon the earnings of the company. This comes out in the form of a very handy check just when the expenses of living are considerably increased around Christmas time. We have company clubs—or employee clubs — formed for recreational activities. Why not utilize these clubs to promote fair conduct among all the employees?

A successful manufacturing plant is dependent upon the efforts of the employer and the employees. It is a big mistake to think that the employer can do it all. Let's get behind profitable production and effect remedies which will eliminate the fellow who takes advantage of any chance he can to shirk his duty toward the whole firm — including himself. You can bank on it that the timekiller, who makes it difficult all year long, will be the first to stick out his hand to take whatever is offered him. He's the first one to yap off his face in complaint if it so happens that the firm has had a hard year and cannot see its way to give a bonus.

Let's do what we all can to rectify any condition that exists which threatens to interfere with the time set aside for mental and physical relaxation.

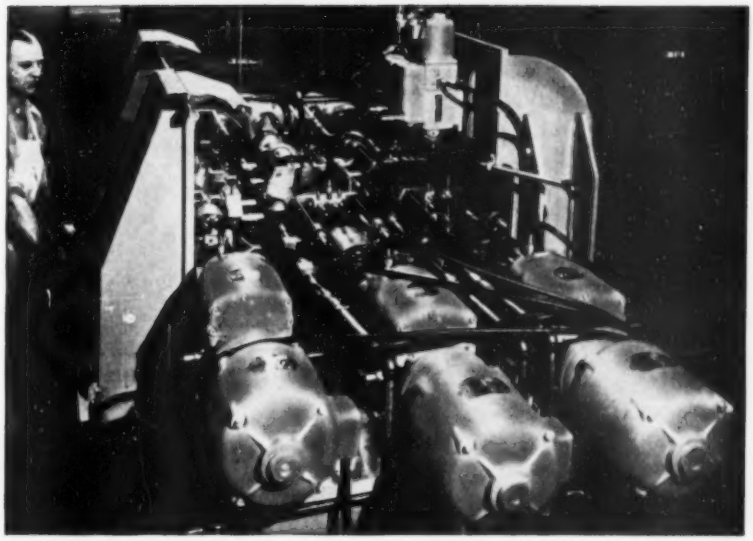
Evelyn Roundbottom
Laguna Beach, Calif

•

JUNGLE LAW

How much responsibility has a foreman toward his company in the matter of lining up and training a successor, particularly if he is considering leaving the firm eventually?

IT SEEMS DOUBTFUL as to whether the call is really for sympathy and compassion, or pity for either or both parties. The issues are so much in conflict. Ought a works management to be so dead to the attitude of its people that it is unaware of the fact that it holds neither the respect nor



Machine Details
Dimensions: 10¾' long, 6½' wide, 7' high; weight about 16,000 lbs. 8 Delta drill units: 6 Model 19-400; 2 Model 19-150. 5 drill units equipped with multiple-spindle drill heads. Total HP—13.

Control Panel
Selector switches make possible any combination of 3 positions, 8 stations—a universal machine. Operator presses a starting button; sequence of operations is automatic; machine stops automatically when work is finished. 3000 feet of wiring between panel and machine.

From 25 minutes to 2 minutes
-that's the time saved by A.B.DICK CO.
with 8 DELTA
AIR-POWERED
HYDRAULIC DRILL UNITS

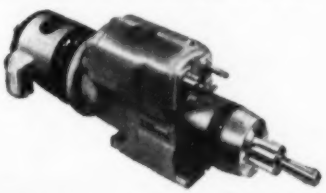
When conventional tools required 25 minutes to complete 9 holes in a spirit-duplicator cylinder, A. B. Dick engineers built their own special horizontal drilling machine, using 8 Delta air powered hydraulic drill units, and now do the job in less than two minutes.

Their new machine drills, spot faces and reams 9 holes in aluminum cylinders—needs but a single operator, has automatic remote control.

Operation of this 3-position, 8-station machine consists of loading and pressing the starting button. The Delta drill units operate in four banks, in automatically controlled sequence of drilling, spot facing, milling and reaming. When the cycle is completed, the finished piece returns to original position and the machine stops. It is universal—handles any piece up to 12" diameter and 24" length.

"This machine is so fast and so accurate," says Edward Brenn, design engineer, "that 3 or 4 days use per month is ample to keep up with production demand. The operator is free for other duties. We just didn't have the equipment to do this job economically—so we built the machine ourselves."

Three Delta air powered hydraulic drill unit models are now available to meet your specific requirements—1½", 4" or 6" stroke; No. 80 to 1" diameter drill. See your authorized Delta drill unit dealer—write for new catalog.



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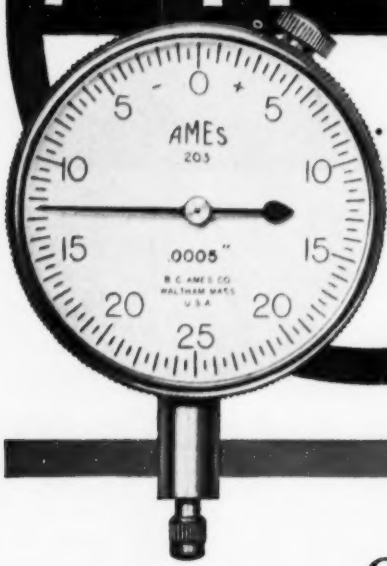
AMES



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The reasons behind this decision are the very reasons why *you* should standardize on Ames dial indicators and dial gauges:—the Ames "Hundred Series" indicators available in four sizes, fit every measuring requirement; they are *accurate, sensitive,* low in friction, yet are *rugged* and *tough*—give *more* on-the-job time. All Ames products embody latest design and highest-quality materials; they are manufactured by methods and machines that are *exclusive* with B. C. Ames Co.

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the loyalty of its staff, and yet seeks a service from one of those who just works there and who does not "pick the foremen, anyway." Someone who is leaving the job because it is not good enough to keep him, and "it's their trouble if they can't replace him," and who, after years of working for the firm feels he owes them nothing. What a pitiable state of things.

Surely such men must be as pygmy-minded as the management is mole-eyed. Ought they not to realize that like tends to breed like, and that each of the parties is likely to reap just that which it has sown, treatment of the kind it has evoked. If a biblical illustration be permitted, it could be asked: Can a harvest of wheat be expected if only tares had been sown? Jungle law must be expected, therefore, so long as either party indulges in jungle practices.

Is industry, and engineering in particular, in practice, so nearly akin to that of the jungle? It gives one "furiously to think."

The writer heard of an old man who had worked in a country textile works. His firm thought he should give up work, and told him so. They did not sling him out as shopwarn, but gave him a present and a small pension. But the next day found the old man back in the mill. To a remark that it was thought that he had left, the old man replied: "Oh no, not left, only retired; there be some things nobody has ever done but myself, and I be come in just to put Jack wise to a few of the difficulties. No, I 'aven't left, I be only retired."

No jungle law here. Can it be because it is not engineering? A word in passing: decent treatment helps, rather than retards efficiency.

P E James
Lincoln, England

"Your inquisitive nature is going to get you into trouble sometime, Jenkins."

NEW BOOKS

OPPORTUNITIES IN MACHINE - SHOP TRADES—*By Benjamin J Stern. Published by Vocation Guidance Manuals, Inc, 45 W 45 St, New York 36, NY. 95 pages, 5½x7⅞ in. Paper bound. Price $1.*

To the young man seeking information as to the opportunities offered by the machine-shop trade, this small book will provide a wealth of information. Without attempting to glorify the trade, it points out clearly what can be expected by a beginner entering the industry.

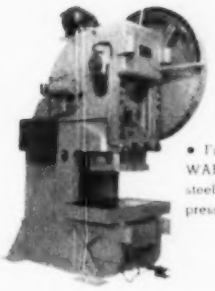
The introduction defines a machinist, gives a brief historical outline of the trade, considers present and future opportunities, outlines the basic requirements for success, and tells the pay that can be expected. Succeeding chapters tell how to become a machinist, how to get started, the various steps of progress, and an analysis of all the various machine shop occupations. Job possibilities in related fields are also discussed, as are labor unions. A list of useful publications is included, together with a list of the various state and federal government apprenticeship agencies.

ENGINEERING STATISTICS AND QUALITY CONTROL—*By Irving W Burr, Prof of Mathematics and Research Associate in the Statistical Laboratory, Purdue Univ. Published by the McGraw-Hill Book Co, 330 W 42nd St, New York 36, NY. 442 pages, 6 x 9 in. Price $7.*

Developed as a text for junior, senior, and graduate students of engineering, this book is the outgrowth of many years of teaching statistics at Purdue and elsewhere. It should be added immediately, though, that this is a lively and immensely readable book on what is most frequently treated as dry, textbook subject matter. Examples are taken directly from actual happenings in industry, and these case studies are handled in an excellent and readable manner. It seems to have been the author's purpose to provide a book which would hold the attention of even a casual reader (if there are such things as casual readers of engineering statistics), and the author has succeeded in this purpose.

One of the factors which contributes to readability is that, from

Here's Why Last Year More Press Buyers Bought Warco



• Front view WARCO welded steel frame OBI press

• Front view WARCO cast steel frame OBI press

• Rear view WARCO welded steel frame OBI press, showing popular WARCO pneumatic friction clutch and brake unit

O.B.I. Presses Than ever Before

The Warco Open Back Inclinable Press Line is designed and built from the frame out to give maximum performance with minimum maintenance. The slide operates in long hand scraped gibways. The main bearings and crank-pin bearings are provided with heavy walled renewable bronze bushings. The crankshaft is of one piece heat-treated and normalized steel forging. Bearings are drilled and tapped and supplied with either Alemite fittings or piped Alemite system. All Warco O.B.I. Presses are supplied with Warco's popular pneumatic clutch and brake units. Many other quality features go to help Warco O.B.I. Presses constantly gain greater acceptance with leading press users. It will pay you, too, to look over the Warco line before buying new presses.

THE FEDERAL MACHINE & WELDER COMPANY
WARREN, OHIO

Federal WELDERS
Warco PRESSES

you have precision problems, too!

As swift technical advances are made, they bring new and interesting production problems. That illustrated is a good example. Axelson, with its experienced designers and engineers, is assisting more and more firms in the solution of their metal turning problems. Axelson lathes are well known for their ability to sustain heavy loads over long periods, to produce precision work with accuracy. Axelson designers and engineers contrive special attachments that answer Industry's need for intricate work. If you want a solution to the problem worrying you, get in touch with Axelson or your nearby Axelson representative.

Write for Axelson Lathe Bulletin #5304.

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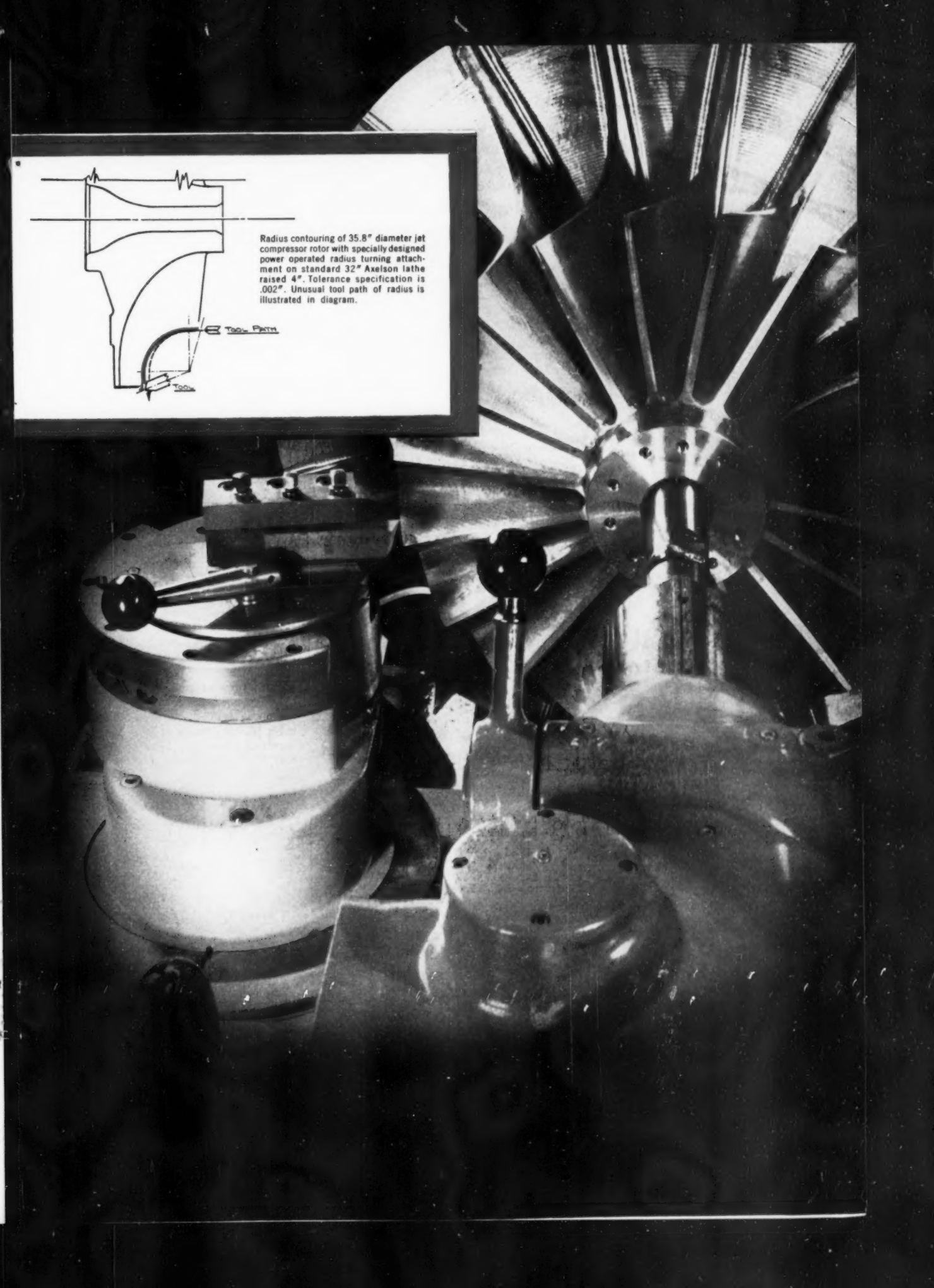

Radius contouring of 35.8" diameter jet compressor rotor with specially designed power operated radius turning attachment on standard 32" Axelson lathe raised 4". Tolerance specification is .002". Unusual tool path of radius is illustrated in diagram.

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64-PAGE CATALOG

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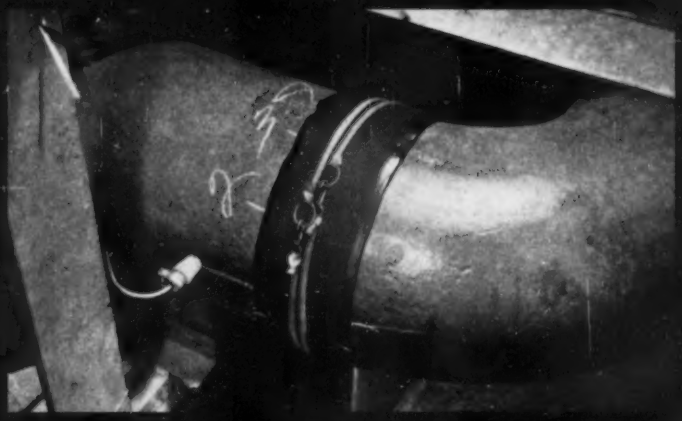
the very beginning, no formulas are introduced without careful explanation and illustration from everyday industrial experience. Also, as the theory expands and becomes more complicated, the author writes understandably enough that, even though the reader might not have previously dwelt on the problems of statistics, each new statement is clear from what has been said earlier in the book. The result is a book which can be read at home, rather than one which requires the services of an instructor in order to learn the subject.

EXPORT CATALOG FOR LOWER SAXONY. — *Published by the Foreign Trade Board of Lower Saxony, Hildesheimer Chaussee 152, Hannover, Germany. 564 pages, 8½x6 in.*

Companies interested in importing any of the wide varieties of products manufactured in Lower Saxony will find this volume highly valuable, as it gives all the information that could be desired.

It is printed in English and German, and contains an alphabetical listing of exporters, an alphabetical list of products, and a classified list of manufacturers. There is, in addition, a list of foreign trade banks, of export and import companies, and other companies in allied lines. There is also a section dealing with foreign diplomatic and consular offices and missions, German chambers of commerce at home and abroad, and a most useful listing of abbreviations internationally employed in commercial correspondence.

"He's been after them for two years to overhaul his machine. Now that it's fixed, he can't make anything but scrap!"



This joint must carry water at 500°F and 1600 p.s.i.

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To gain top efficiency, modern power plants are operating at higher pressures and higher temperatures—conditions which call for utmost dependability in the welded joints of the piping.

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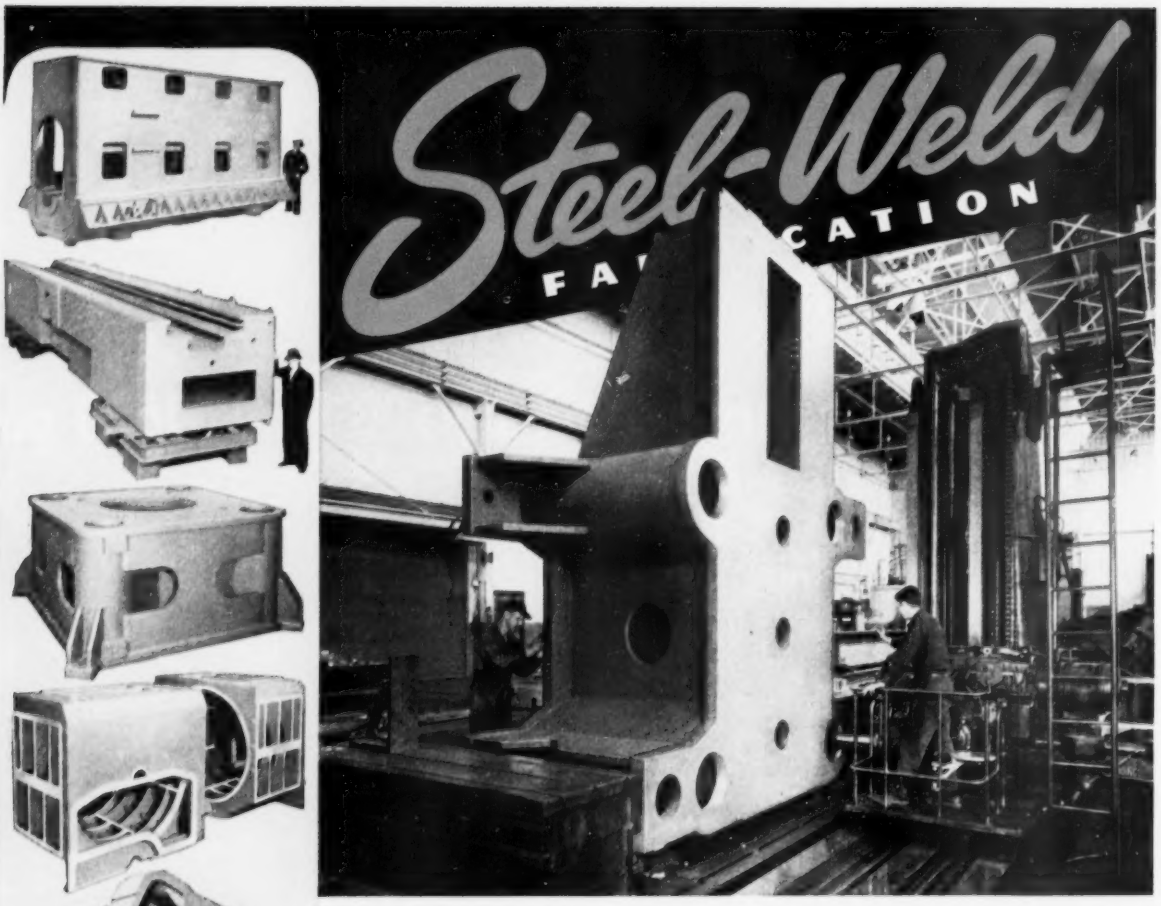

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for Greater Strength
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The forty ton Press Platen above, and the parts and assemblies illustrated at the left, are typical of thousands of Steel-Weld Fabricated units produced and machined by Mahon for hundreds of manufacturers of heavy machines and other mechanical equipment. If parts of your product could be redesigned and produced to better advantage through Steel-Weld Fabrication, or, if you require a limited number of large heavy pieces in which pattern costs are a consideration, you can turn to The R. C. Mahon Company with complete confidence . . . personnel and facilities are available within the Mahon plant to do the complete job from drawing board to finished machining. You will find in the Mahon organization a unique source with complete ultramodern fabricating, machining and handling facilities to cope with any type of work regardless of size or weight . . . a source where skillful designing and advanced fabricating technique are supplemented by craftsmanship which assures a smoother, finer appearing job embodying every advantage of Steel-Weld Fabrication. See Mahon's Insert in Sweet's Product Design File, or write for further information.

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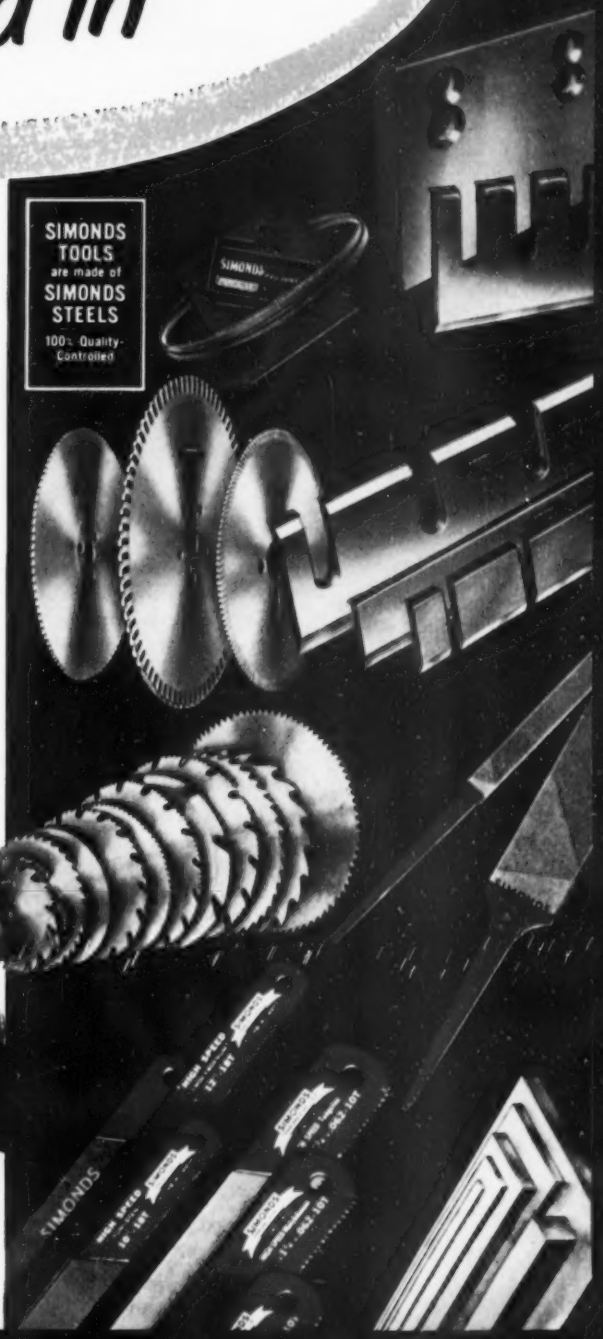

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Remember the days of the "airplane ear-ache"? . . the kind caused by low cabin pressure when your plane or airliner flew above 8,000 or 10,000 feet? Well, fortunately, "airplane ear-aches" are pretty much a thing of the past now . . particularly on today's high altitude airliners.

Airlines, always alert to anything that will make passengers more comfortable, called for equipment that would keep cabin pressures normal . . so passengers wouldn't be bothered with ear-aches.

The result was the *cabin pressurization compressor* . . one of the important parts of which is a little impeller wheel. It looks simple . . but it isn't. Some of the country's better engineers spent quite a few years working on it.

Each impeller wheel, after it is machined, has to be heat treated. Engineers of AiResearch Manufacturing Company who developed the wheel (and the compressor) demanded absolutely the correct heat treatment . . for each one represented a great deal of expense, time and effort.

*It was a job for Lindberg Steel Treating Company!** Lindberg heat treating specialists determined precisely the correct method of heat treating . . the required heating temperature . . and exactly the right quenching procedure.

Aircraft inspection standards required that each wheel be inspected, not at one, not at two, not at three . . but at *four* distinct specified locations for proper hardness. No impeller wheel left the Lindberg plant without being certified by serial number. Not a single thing was taken for granted.

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A case history of Lindberg Steel Treating Co. service to American industry

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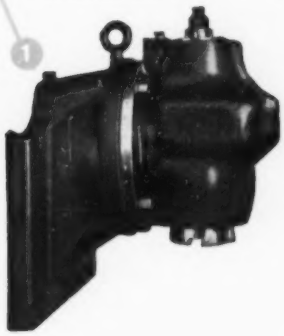
Converts horizontal to vertical machine, retaining identical spindle characteristics. (Bulletin No. 105)



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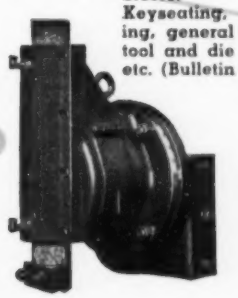

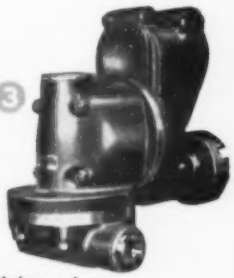

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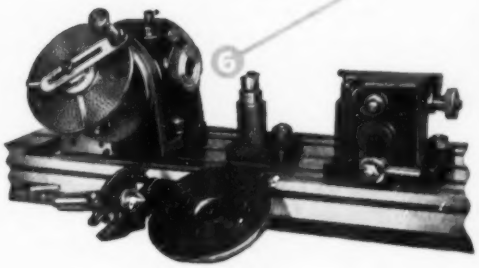
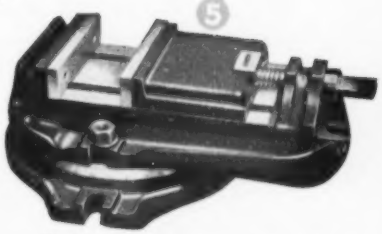
Dividing Head
Precision indexing. Spiral cutting mechanism and chuck also available. (Bulletin No. 119)





Vises
Standard and Heavy-Duty, plain and swivel types. Adaptable to special jaws to save fixtures. (Bulletin 117)

THE KEMPSMITH MACHINE CO., MILWAUKEE 14, WISCONSIN, U. S. A.

KEMPSMITH

Precision Built Machine Tools Since 1888

The KEMPSMITH MACHINE CO.
Milwaukee 14, Wis., U.S.A.
Please mail me copy of bulletins No. .....

Name ..... Title .....

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THESE 3
FREE-MACHINING
...COLD-FINISHED

LEADED NOW

MACHINES 45% FASTER THAN B1113

CUT YOUR COSTS WITH THESE FASTER MACHINING BARS

At last you can switch over to LA-LED lead-bearing, free-machining steel bars for additional applications. This faster machining LaSalle steel cuts your parts cost and also improves your product. And because it is an open-hearth steel, LaSalle LA-LED has the added qualities of ductility, fine finish, and satisfactory carburizing. It maintains close dimensional accuracy, and can be crimped, riveted, staked, and cold worked. Available in rounds $\frac{5}{16}$" through 3", and hexagons $\frac{5}{16}$" through $1\frac{1}{2}$".

La Salle STEEL COMPANY

Manufacturers of the Most Complete Line of Cold-Finished Carbon and Alloy Steel Bars in America!

STEEL BARS AVAILABLE!

New! Super LA-LED®

ACTUALLY REPLACES BRASS!

MACHINES 80% FASTER THAN ORDINARY SCREW STOCKS

New! LEADED ALLOYS
.20 Carbon—.40 Carbon

ALL THE PROPERTIES OF ALLOY BARS PLUS GREATER MACHINABILITY!

Now you can get both Leaded 8620 and Leaded 4140 cold finished steel bars. Being leaded, they machine one-third faster! Heat treating characteristics, hardenability, and mechanical properties are not appreciably affected by the addition of lead.

Here is the fastest machining steel ever commercially developed—Super LA-LED. Its exceptional machinability permits its use for those parts which previously could be machined economically only from brass. Since machine capacities so often limit the daily production of brass parts, you can now use Super LA-LED and obtain production approaching that of brass—and drastically cut the part cost.

Send for these Bulletins

LA SALLE STEEL COMPANY
1416 150th Street
Hammond, Indiana

Please send me the following La Salle Helpful Data Bulletins:

☐ LA-LED #9 ☐ Super LA-LED #12 ☐ LEADED ALLOYS #14

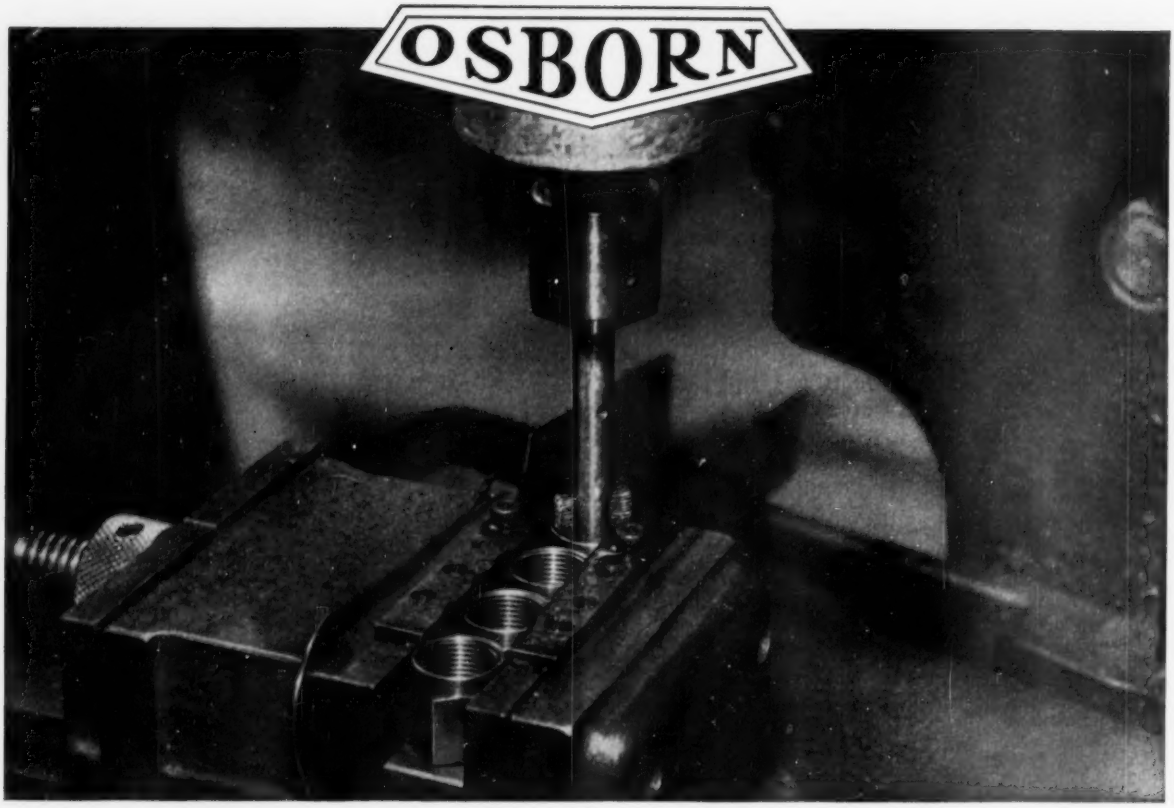
Name_____

Title_____

Company_____

Address_____

City_____ Zone____ State_____



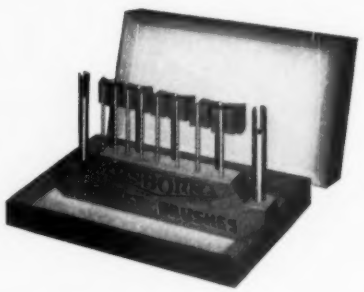
This brush cleans up when the chips are down

Deep down in the threads of these stainless steel coupling nuts are tiny abrasive chips and burrs which can ruin a good fit and costly thread gages.

The problem here was to clean out those chips and burrs *completely.* Hand methods were slow and far from thorough. The inspection bench kept sending too many back for re-working . . . time-consuming, costly.

Then Osborn Situft Brushes were tried and the threads were deburred and "de-chipped" quickly and cleanly every time. Mounted in its holder, the Situft Brush is chucked in the tapping head. Then the brush *threads* its way in at 100 fpm, reverses and threads its way out at 200 fpm . . . the bristles getting down to the roots of the threads and removing all abrasive chips and burrs without a miss.

If you have any kind of a deburring, cleaning or finishing problem, a special Osborn-equipped machine or Osborn brushing machine may be the answer you're looking for. We'd be glad to send you the new free Bulletins on Situft Brushes and Automatic Deburring. Or, if you prefer, why not take advantage of the wide experience of your **O**sborn **B**rushing **A**nalyst to help on your problem. Call him today, or write *The Osborn Manufacturing Company, Dept. C-12, 5401 Hamilton Avenue, Cleveland 14, Ohio.*



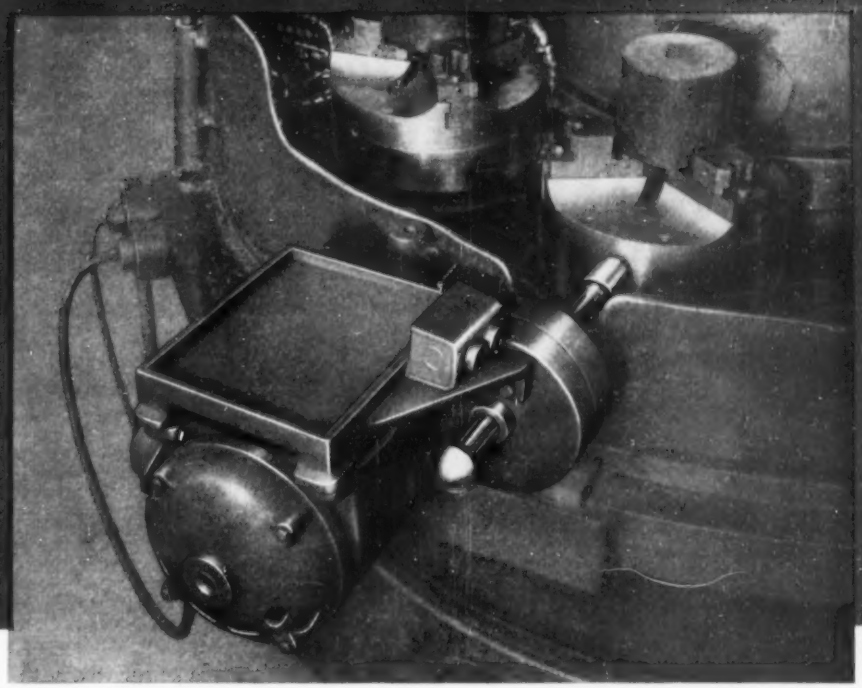
Kit of Situft Brushes and holders is available. Variety of brush sizes to suit various applications. Write for bulletin on Osborn Situft Brushes.

Osborn Brushes

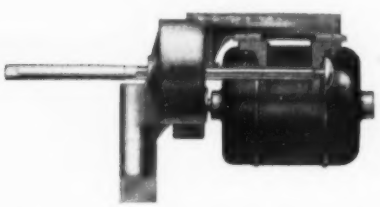
OSBORN BRUSHING METHODS • POWER, MAINTENANCE AND PAINT BRUSHES • BRUSHING MACHINES • FOUNDRY MOLDING MACHINES

CUSHMAN

POWER WRENCH REDUCES OPERATOR FATIGUE *SPEEDS PRODUCTION* ON MULTI-SPINDLE MACHINES



Conserve your man-power and speed production with the Cushman Electric Power Wrench, designed and developed by the Cushman Engineering Department for use on multi-spindle chucking machines and vertical lathes to eliminate physical labor and time-consuming hand wrenching operations. When used with the Cushmatic Control Cabinet, torque at the wrench end can be predetermined and maintained at any desired value from 150 to 600 ft. lbs. with a 24 ft. lb. motor, or 45 to 180 ft. lbs. with an 8 ft. lb. motor. All parts are totally enclosed and operated in an oil bath, assuring constant, dirt-free lubrication and long, trouble-free, heavy duty service. Write for Bulletin No. 211-D or consult the Cushman Engineering Department for special applications.



THE CUSHMAN CHUCK COMPANY
810 WINDSOR STREET
HARTFORD 2, CONNECTICUT, U. S. A.

Chucking Engineers Since 1862

Manufacturers of

AIR CHUCKS, CYLINDERS, and ACCESSORY EQUIPMENT • THE CUSHMAN POWER WRENCH • CUSHMAN MANUALLY OPERATED CHUCKS and FACE PLATE JAWS.

A WORLD STANDARD FOR PRECISION

now, there are MORE MEN with holes in their heads!

announcing:

MADISON GUN DRILLING

by **MADISON INDUSTRIES, INC.**

(affiliated with Madison Manufacturing Company)

This affiliation provides industry with an unusual hole-making team. The long-time specialization of the Madison Manufacturing Company in inner diameters is now expanded through this affiliation to offer industry greater versatility in meeting today's exceptional production demands.

Now, Madison Adjustable Boring Tools for rough and finish boring of inner diameters to wide or close tolerances, *and* Madison Gun Drills for "deep hole" drilling to the smaller diameters, are offered you through the *same* representatives, from the *same* background of engineering "know how" and service.

Write for information on Madison Gun Drills today

MADISON

MADISON INDUSTRIES, INC.

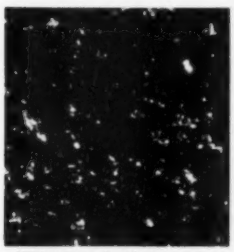
Post Office Box 131 **MUSKEGON, MICHIGAN**

Heavy Zinc Phosphate Coatings for Steel

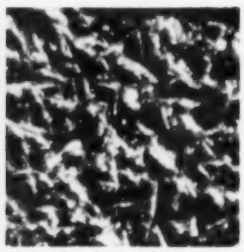
In developing the Oakite CrysCoat HC* Process—which converts a steel surface into a continuous coating of complex metal phosphates—the chemists of the Oakite Research Laboratory made use of a chemical reaction which conquered some of the major obstacles that interfered with the success of older phosphating processes.

The primary aims of this research were to produce a phosphate coating that would provide a good foundation for paint and would give the steel reliable protection against electrochemical corrosion.

These aims were realized with a coating—composed principally of zinc phosphates—that weighs more than 200 milligrams per square foot, thus exceeding the requirements of U.S. Government Specifications JAN-C-490, Grade 1; 57-0-2C, Type 2, Class C and PA-PD-191, Rev. A. In regard to corrosion, the test panels usually run well over 500 hours in the salt spray chamber without showing any signs of blistering or peeling in the types of paint ordinarily used in ordnance production.



Without a phosphate coating, cold-rolled steel possesses poor paint - bonding characteristics and no protection against electrochemical corrosion.



This CrysCoat HC coating of phosphate crystals protects against corrosion and provides an excellent foundation for paint. Magnified 67.5 times.

Secondary aims of the research were to develop a process that would produce little sludge and scale, that would not require overly expensive equipment and that would be easy to control.

While all of these aims were accomplished, the most remarkable gains were made in the field of control.

Perhaps the best way to describe the simplicity of the Oakite CrysCoat HC Process is to say that it requires no skilled chemist to serve as baby-sitter.

Only one material—the liquid called Oakite CrysCoat HC—is used in the phosphating stage. No other material—such as accelerator, starter, toner or other additive—is used for making up the solution or for keeping up its concentration.

Only one type of titration is needed to keep the CrysCoat HC process under control and there is no need for regular determination and adjustment of pH.

More information about the simplicity and reliability of the Oakite CrysCoat HC Process is given in a 12-page, illustrated booklet titled *"How to apply better zinc phosphate coatings to steel in preparation for painting."* To obtain a free copy, mail the coupon at the right.

At Consolidated Industries, Lafayette, Ind., Superintendent Edwin Everhart and Oakite Technical Service Representative Walter Sittman watch part of a disposable gas tank go into the CrysCoat HC solution.

*HC means Heavy Coating

Advertisement

*This comment came from a Pennsylvania munitions maker, who added that Oakite CrysCoat HC has put an excellent zinc phosphate coating on 385,000 shells with "absolutely no trouble . . . maintenance and control are very easy."

The Oakite CrysCoat HC coating on steel products—such as artillery shells, rocket fins, auto parts, etc.—weighs more than 200 milligrams per square foot. It more than meets the requirements of U. S. Government Specifications:

JAN-C-490, Grade 1 **57-O-2C, Type 2, Class C**

PA-PD-191, Rev. A

The Oakite CrysCoat HC Process for preparing steel for painting—either in spray-washing machines or in tanks—has five big advantages:

1. The heavy CrysCoat HC coating forms a strong foundation for the lasting adhesion of paint. *See page 5 in free booklet.*
2. The heavy coating gives excellent protection against electrochemical corrosion. *See page 7.*
3. The CrysCoat HC Process is easy to control. Only one material is used for make-up and up-keep. No accelerators, starters, toners or other additives are needed. Only one simple type of titration is used. *See page 9.*
4. The CrysCoat HC reaction produces relatively little sludge and scale. *See page 10.*
5. Stainless steel is not necessary for all parts of the equipment. *See page 11.*

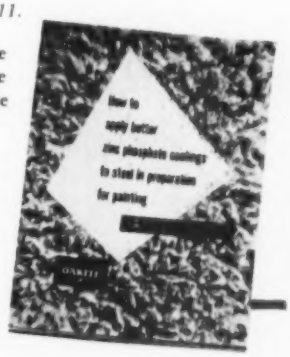
FREE For complete information, mail the coupon for a copy of our 12-page illustrated booklet describing the Oakite CrysCoat HC Process.

SPECIALIZED INDUSTRIAL CLEANING

OAKITE

MATERIALS • METHODS • SERVICE

Technical Service Representatives in Principal Cities of U. S. and Canada



OAKITE PRODUCTS, INC.
24 Rector St., New York 6, N. Y.

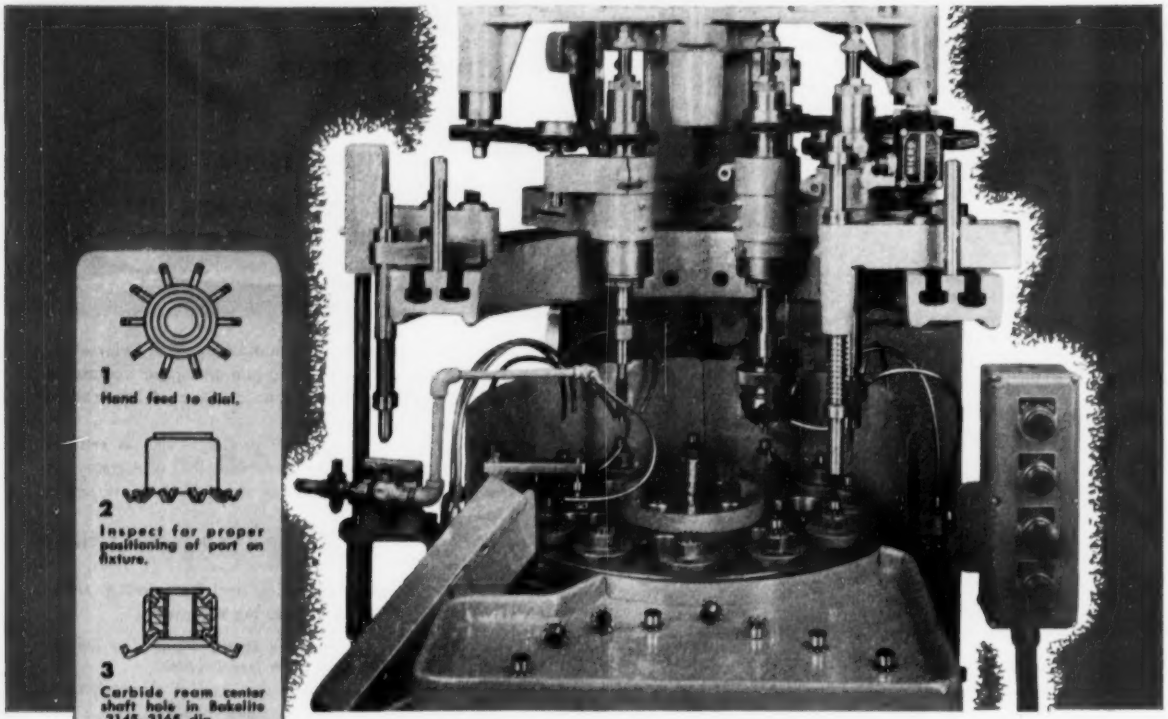
Send me a FREE copy of *"How to apply better zinc phosphate coatings to steel in preparation for painting."*

*Name*_____

*Company*_____

*Address*_____

Bodine CASE HISTORY NO. 36



1
Hand feed to dial.
2
Inspect for proper positioning of part on fixture.
3
Carbide ream center shaft hole in Bakelite .3145-.3165 dia.
4
Carbide hollow mill on O.D. .691-.693 dia., using piloted hollow mill.
5
Carbide face Bakelite shoulder piloting in reamed hole.
6
Automatically eject.

PROCESSING A COMMUTATOR FOR A SMALL ELECTRIC MOTOR (Copper, molded in Bakelite)

FEATURING . . .

Carbide tools to (1) maintain high production speeds and longer tool life in extremely abrasive materials; (2) maintain close tolerances on machining operations.

PRODUCTION:

1070 pieces per hour at 85% efficiency. Machine used is the Bodine Model 41-20 tooled as a straight driller. This model can be tooled for drilling, tapping, milling, single or double screw inserting, and assembly operations . . . or any grouping desired. If you require high speed production at low costs, this is your machine.

"You Can't Meet Tomorrow's Competition With Yesterday's Machine Tools"

THE Bodine CORPORATION
BRIDGEPORT 5, CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

3BD53

Disston®

now presents the sharpest,
cleanest, best cutting

HACK SAW BLADES ever made

Far Greater Dollar Value!
Longer Life!

AFTER long research, Disston has developed new equipment and new methods for making hack saw blades!—blades that are far superior in all respects to ordinary blades! —blades that promise users extraordinary benefits!

To achieve this, Disston engineers have had to give these blades the four qualities that any hack saw blade *must* have for clean, accurate cutting during a long service life.

Your Disston Distributor will give you an eye-opening demonstration right in your plant—a comparison of your present blades with the new Disston blades. It won't take long for you to see that these blades offer *better cutting, far greater dollar value, longer life!*

Get far more for your hack saw dollars, call your Disston Distributor today!

HENRY DISSTON & SONS, INC.
1120 Tacony, Philadelphia 35, Pa., U.S.A.
Canadian Factory: 2-20 Fraser Ave., Toronto 3, Ont.

Look for these qualities when buying blades

1. ***Uniform Hardness*** Proper heat treatment eliminates weak spots, reduces breakage. Blades must be straight and free of any sweep. *All Disston Blades are uniformly hardened!*

2. ***Accurate Set*** Character and degree of set must be accurately controlled so that each tooth does its share of the work. *All Disston Blades are accurately set!*

3. ***Sharp, Uniform Teeth*** Teeth must be truly sharp to cut efficiently. Contours must be uniform, for strength and effective chip disposal. *All Disston Blades have sharp, uniform teeth!*

4. ***Straightness*** Blades must be free of sweeps, humps, or hollows. (Note diagram below.) *All Disston Blades have parallel edges!*

For prompt service, expert advice, reliability, many economies SEE YOUR DISSTON DISTRIBUTOR

Any way you look at it...

SQUARE D's balanced design means a better Motor Starter

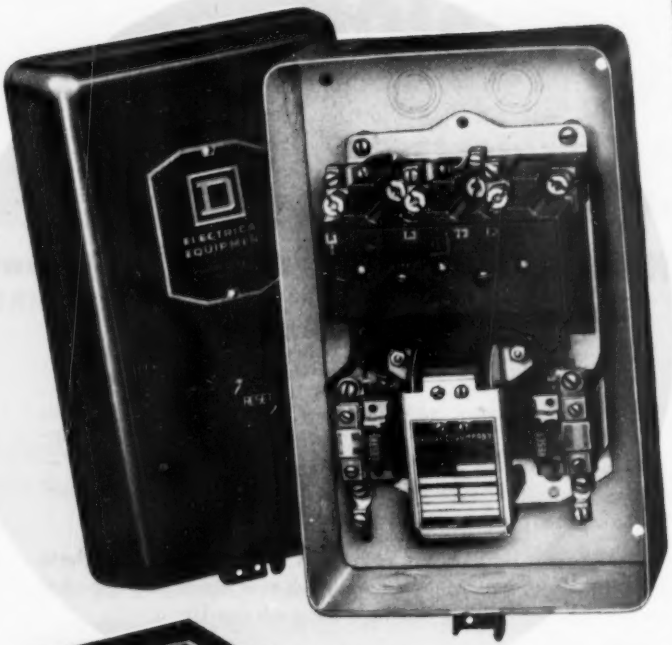
Designed to provide the highest degree of accessibility, flexibility, and compactness —with no sacrifice of performance and long life.

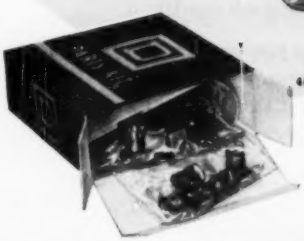
EASY WIRING...
Plenty of wiring space and easy-to-get-at solderless terminals. Installation is a breeze.

ACCESSIBILITY...
Coils, contacts or overload relays can be changed without disturbing external connections. A screwdriver is the only tool you need.

FLEXIBILITY...
Three extra electrical interlocks may be added to size 1 starters; four to sizes 2 and 3. Contacts may be normally open, normally closed, or double circuit.

PERFORMANCE...
Straight line, guided motion minimizes wear. Large silver alloy contacts insure exceptionally long life and trouble-free performance.





"Off-the-Shelf" Parts Kits make normal maintenance easier than ever. Each kit contains parts necessary to replace all load contacts and finger springs. Electrical interlocks also available in kit form.

Write for Bulletin 8536
Square D Company, 4041 N. Richards Street, Milwaukee 12, Wisconsin

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

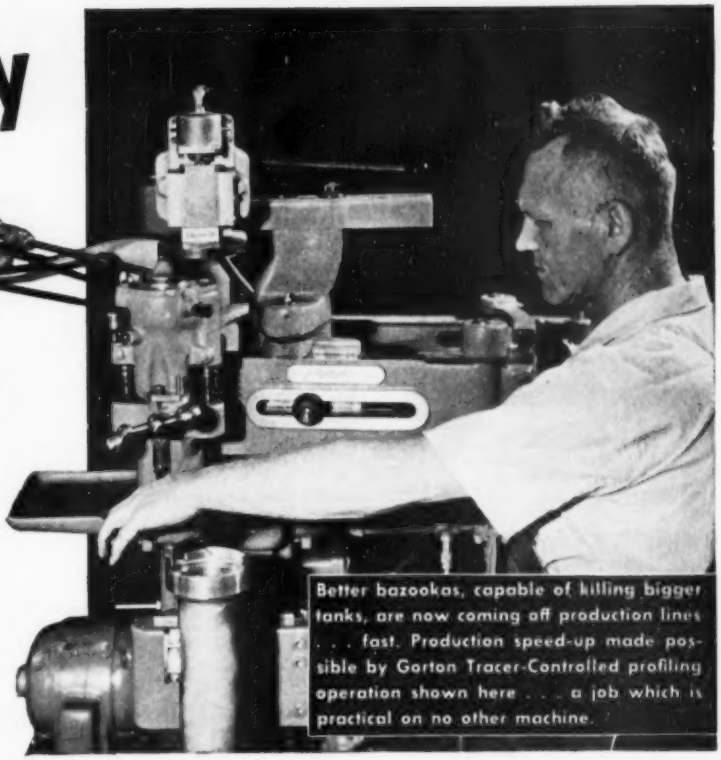
SQUARE D COMPANY

1903 · 50 YEARS OF DESIGN LEADERSHIP · 1953

Pantography at Work!

★

Inside profiling operation produces more than 36 pieces per hour with Gorton Tracer Control. Approximate time by the next best method . . . one piece every two hours.



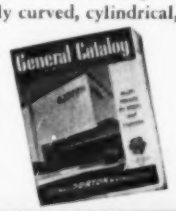
Better bazookas, capable of killing bigger tanks, are now coming off production lines . . . fast. Production speed-up made possible by Gorton Tracer-Controlled profiling operation shown here . . . a job which is practical on no other machine.

GORTON

- **IMPROVES QUALITY**
- **INCREASES PRODUCTION**
- **CUTS COSTS**

On many all-but-impossible jobs, Gorton Tracer-Controlled Pantographs and Duplicators speed up production on military or industrial contracts. High surface finish results from spindle speeds up to 45,000 R.P.M. Accuracy results from the use of over-size masters, patterns, or templates together with the reduction ratio which is exclusively characteristic of the pantograph. Whether a dozen or a thousand pieces, each is identical to the first. Work piece size varies from instrument parts to areas of 10 by 20 feet.

Gorton tracer-controlled equipment quickly pays for itself in profiling, routing, die sinking, mold cutting, counterboring, chamfering, grooving, graduating, engraving as well as many other standard or special operations on ferrous or non-ferrous metals and plastics where work is flat, uniformly curved, cylindrical, spherical or irregular in shape.



Mail the coupon below for General Catalog illustrating the complete Gorton line.

PRODUCTION DATA—

JOB: Profile 6 locking lugs for male and female sections of new 3.5" Bazooka.

MATERIAL: Aluminum alloy.

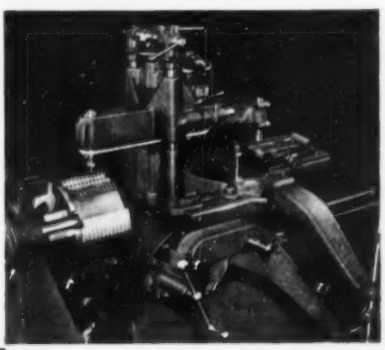
CUTTER: 5/32" dia. single flute, fast spiral H.S. steel running at 3,900 R.P.M., without coolant.

MASTER: 2 masters: one for male and one for female sections; 3 times oversize, traced manually.

HOLDING FIXTURE: Pneumatic-operated internal expanding type.

APPROX. TIME: 36 pieces per hour.

ALTERNATE METHODS: None practical.



THIS OPERATION SPEEDED UP 6 TIMES

Gorton Tracer Control chamfers ends of interrupted threads in breech ring and on breech block of 155 mm. gun. Previous time, 4 hours; Gorton time, 40 minutes.

GEORGE GORTON MACHINE CO.

1511 Racine St., Racine, Wis., U.S.A.

Please send at once complete information about the Gorton line contained in Bulletin 1655 1511

Firm .....

Name .....

Title .....

Address .....

City, State .....

P3554-R

DO YOU HAVE

"SPECIALS" PROBLEMS

Polished, spherical head hardened to Rockwell C-64. Balance of screw hardened to Rockwell C-40.

Screw body continuous threaded, cross-drilled, and rifle-drilled for oil passages.

Base machined for socket-head installation and adjustment. All measurements held to specifications.

When you run into screw requirements like this special part, you can rely on Mac-it to produce it for you—**exactly to your specifications!**

One of the major requirements of this special part was that it possess two different degrees of Rockwell hardness—Rockwell C-64 for the spherical head, and Rockwell C-40 for the balance of the screw. This problem was readily solved with Mac-it "selective" hardening processes. The screw body was cross-drilled and rifle-drilled for oil passages. All measurements were held to very close tolerances, and the base was machined for socket-head installation and adjustment.

The resulting Mac-it screw met all specifications exactly — typical of all Mac-it products. When you need special screws, call or write your nearest Mac-it distributor or the Main Office, Cleveland, Ohio.

MAC-IT SCREW DEPARTMENT

STRONG, CARLISLE & HAMMOND COMPANY

1392 W. 3RD. STREET • CLEVELAND 13, OHIO

Manufactured by Mac-it Parts Co., Lancaster, Pa.

There's a Walker Magnetic Chuck for Every Known Application . . .

For sixty years, Walker has specialized in the designing and production of magnetic holding devices. Today, Walker produces a complete line of magnetic chucks and designs special chucks to meet unusual holding problems.

●

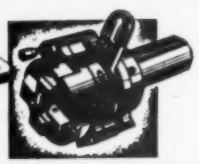
Standard Electro and Permanent Magnetic Chucks . . . Vacuum Chucks . . . Special applications for various holding problems . . . Demagnetizers . . . Magnetic clutches.

O. S. WALKER CO. Inc.

WORCESTER 6, MASSACHUSETTS

Original Designers and Builders of Magnetic Chucks

H&G Insert Chaser DIE HEADS



famous for accuracy and straightness of threads, low chaser costs, less downtime, more pieces per day.

THE EASTERN MACHINE SCREW CORP., 29-40 Barclay St., New Haven, Conn.
Pacific Coast Representative: *A. C. Behringer, 334 N. San Pedro St., Los Angeles, Calif.* Canada: *F. F. Barber Machinery Co., Toronto, Can.*

IMPORTANT NOTICE

The Genuine MAUSER **VERNIER CALIPER**

IS NOW MADE OF **STAINLESS STEEL** THROUGHOUT

AND THE FOLLOWING IMPROVEMENTS HAVE BEEN ADDED

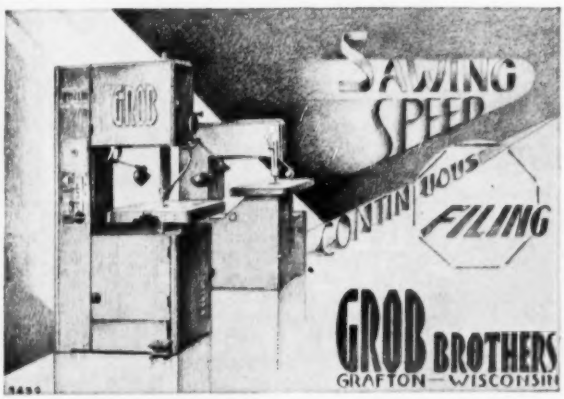
- HARDENED PHOSPHOR-BRONZE adjustable gib retains accuracy
- SPECIALLY LONG VERNIERS to read thousandths
- 3 GRADUATIONS - 1/1000" - 1/128" 1/10 mm in back

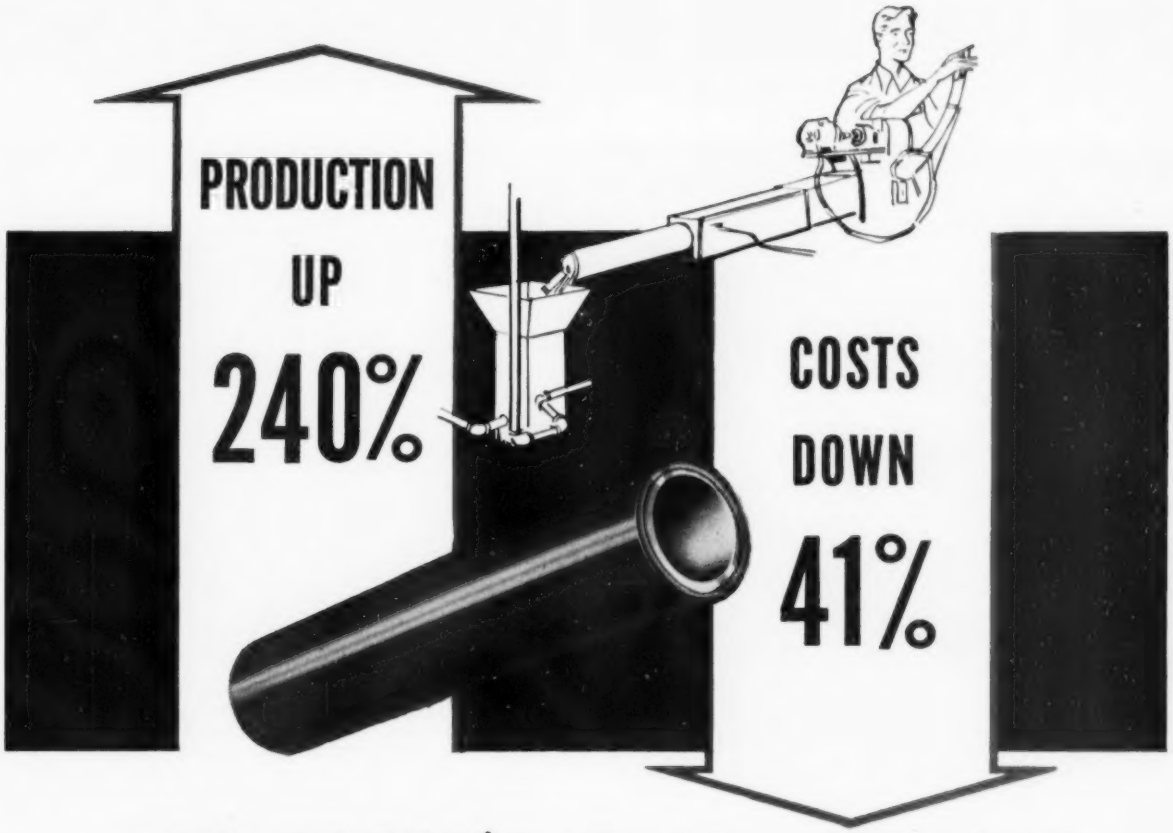
$14.75 PPD

Request illustrated folder showing complete line of MAUSER Toolmakers Calipers, Height Gages, Bevel Protractors and Tool Steels.

GEORGE SCHERR CO., Inc.

200-AM Lafayette St., N. Y. 12, N. Y.





with TOCCO* Induction Heating

Whether you're interested in upping production or downing costs—or both—it pays to investigate TOCCO Induction Heating if you heat-treat, anneal, braze, solder, forge or melt ferrous or non-ferrous metal parts.

PRODUCTION UP—When Thompson Products Ltd., St. Catharines, Ontario switched from conventional methods to TOCCO Induction Hardening of their automotive wrist pins, production rose from 500 to 1200 per hour.

COSTS DOWN—While production jumped, costs fell from $5.46 per hundred parts to $3.23—a savings of more than 2c per pin or $26.76 per hour on the hardening operation alone.

OTHER ADVANTAGES—Additional savings result from elimination of hauling wrist pins to and from the heat-treat department. Cool, clean TOCCO fits right in the production line, next to related operations—takes only ¼ the space of the pusher-type furnace previously used.

In Canada or the United States TOCCO engineers are glad to survey your operations for similar cost-cutting results—no obligation, of course.

THE OHIO CRANKSHAFT COMPANY

TOCCO

Mail Coupon Today

NEW FREE BULLETIN

THE OHIO CRANKSHAFT CO.
Dept. B-11, Cleveland 1, Ohio

Please send copy of "Typical Results of TOCCO Induction Hardening and Heat Treating".

Name_____

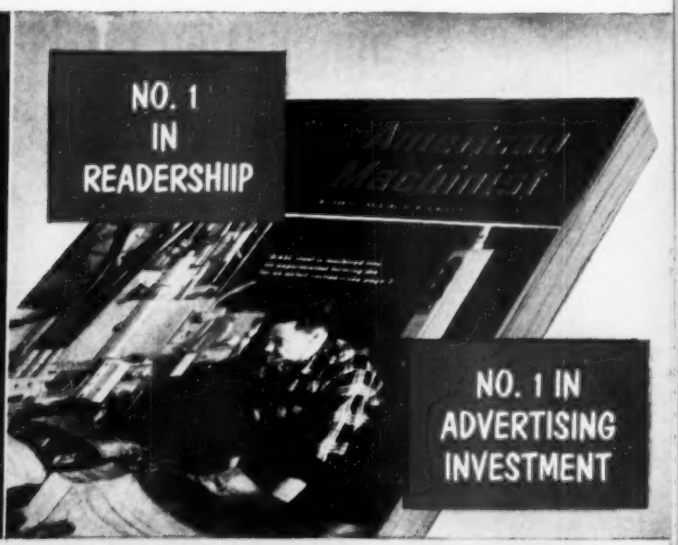
Position_____

Company_____

Address_____

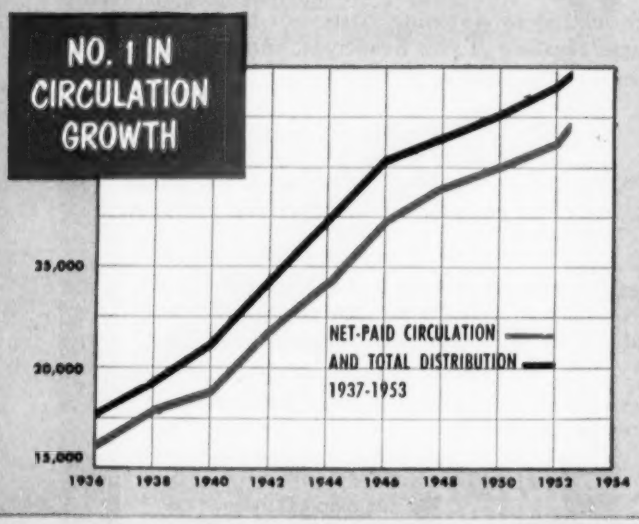
City_____ Zone____ State____

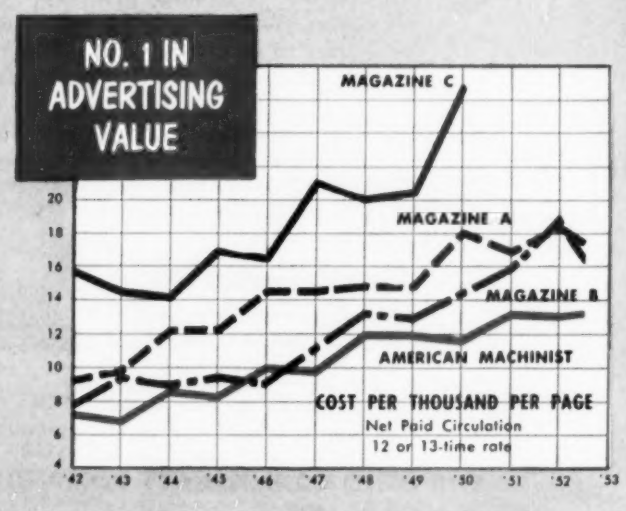
Put the POWER OF LEADERSHIP behind



For many years, the facts have shown that metalworking production executives find *American Machinist* by far the most useful of all magazines edited for them . . . and that advertisers accept this publication as the No. 1 medium for advertising to Metalworking's most important buying group.

Year after year, *many more* production-responsible metalworking engineers and executives subscribe to *American Machinist* than to any other metalworking publication. Advertisers to Metalworking also invest the most advertising dollars in *American Machinist* . . . and the most pages of advertising for the machinery, equipment, materials, and supplies which will next year produce an expected $110-billion of metalworking products.

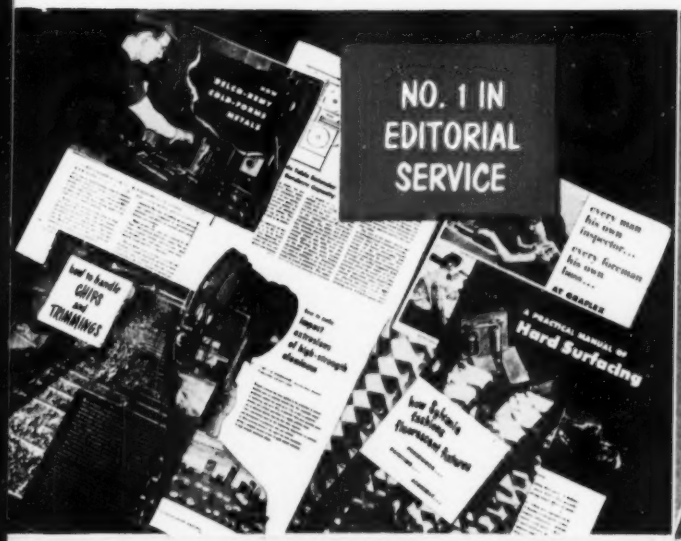




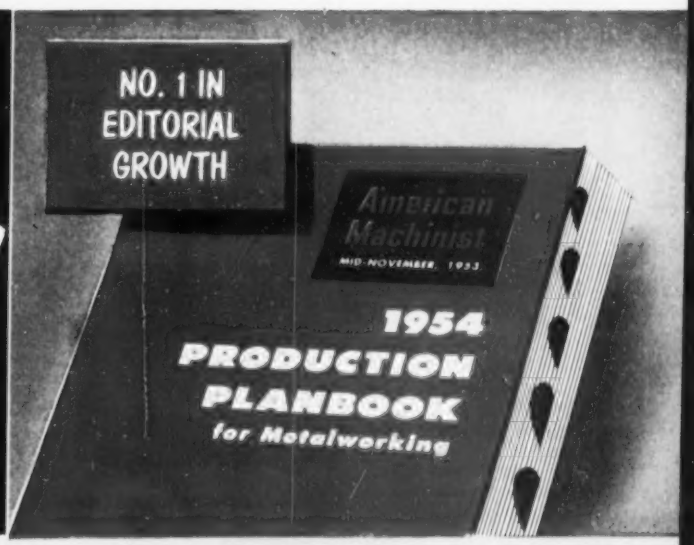
. . . a preference that is everywhere expressed in Metalworking by the caliber and number of men who are paid subscribers to this magazine. They number more than 32,600 now . . . which is, by over 7,000, the largest group of subscribers to any metalworking publication available to sell your products.

And this is, in brief, the kind of LEADERSHIP you want from a metalworking magazine in which you concentrate your advertising. It is the kind of PROVED leadership which backs the choice of *American Machinist*, by over 800 advertisers, as a sales-wise advertising medium.

your advertising to Metalworking



And as you make your 1954 advertising plans, it is important to know that the LEADERSHIP *American Machinist* can now put behind your advertising is greater than ever. Hundreds of exclusive articles and special reports . . . representing far more outstanding and productionwise information than any other magazine has published . . . have steadily broadened and strengthened *American Machinist's* metalworking-wide acceptance and prestige . . .



. . . and this November will see *American Machinist's* editorial leadership further emphasized with publication of the 1954 PRODUCTION PLANBOOK for Metalworking . . . the first in an annual series of PRODUCTION PLANBOOKS that will now add their exclusive data to all the other help *American Machinist* regularly provides. Featuring a new Inventory of Metalworking Production Equipment, the 1954 PRODUCTION PLANBOOK's great usefulness will add impetus to the constantly growing preference for *American Machinist* . . .

SO . . . when *you* seek increased sales in the $110-billion Metalworking Industry, and want to build preference for your products among this industry's most important buying group . . . production management . . . the facts will tell you why:

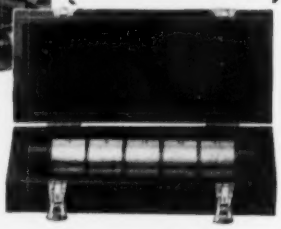
<u>This</u> is the No. 1 place to do business with America's biggest industry

The McGraw-Hill Magazine of Metalworking Production
McGraw-Hill Building, New York 36
Published Every Other Monday
Member of the Audit Bureau of Circulations and
the Associated Business Publications

ABP ABC

Check Surface Roughness Waviness and Lay INSTANTLY
. . . Right At The Machine

With ACME'S ROUGHNESS COMPARISON SPECIMENS



Consists of various surface specimens, *individually finished* to definite micro-inch readings, grouped together in one handy comparison bar. Merely hold bar opposite work for fast, visual comparison check of surface roughness, waviness and lay.

Available in groups of 3, 5 and 8 specimens. Low cost. Write for details, now!

Mfr's. of Drill Jig & Fixture Bushings

ACME INDUSTRIAL COMPANY

209 N. Laflin St. Chicago 7, Illinois

THE SERVICE SHOP TO INDUSTRY FOR OVER A QUARTER CENTURY

BIG JUMP FORWARD
in Boring and Facing!

SIX SIZES AVAILABLE

ALL HAVE POWER FEED FOR FACING!

• A Boring Head that Won't Face is Not Complete

REDESIGNED, MANY NEW FEATURES

WRITE *for Complete Details*

Model "D"

CHANDLER TOOL CO.
Muncie, Indiana

COMBINED BORING & FACING TOOL HEADS

Chandler-Duplex

waiting for you

Gone are the days when you had to wait for delivery on most punches and dies while they were made to order. *Now they wait for you.*

Over the years, we have consistently been adding to our line of standard tools and today have in stock for *immediate shipment* 76 styles of punches and 65 styles of dies in a large range of round, flat, oval, and square sizes . . . and this expanding goes on.

Besides the saving of valuable time, *you save money.* It stands to reason that special tools made up in small lots are going to cost a good deal more than the standard tools made up in large quantities with production costs allocated over a great many pieces.

We will be glad to send you a set of our catalog sheets which list our complete line of "special yesterday—standard today" punches and dies.

Manufacturers of metalworking tools for 64 years.

T. H. LEWTHWAITE MACHINE CO., INC.

313 East 47th Street **New York 17, N. Y.**

What's ahead for Metalworking?

How much is industry planning to invest in new machinery and equipment in the near future? Exactly how have other Metalworking production executives like yourself successfully applied modern methods and equipment to their problems? How does your machinery size up against that of your competitors?

You'll find hundreds of pages of indispensable data, tailored to your needs, in your

1954 PRODUCTION PLANBOOK for Metalworking

. . . featuring a new Inventory of Metalworking Production Equipment.

The *PLANBOOK* will come to you this month at no extra cost, as part of your regular subscription to *American Machinist.*

American Machinist
330 West 42nd Street
New York 36, N. Y.

LOBDELL UNITED CO.'S TOOL DRESSING PACKAGE
Capacity 150 tools per hour, up to 2" square
COMPLETE IN ONE PACKAGE
LOBDELL UNITED COMPANY
NOW!
THIS NEW BULLETIN

TELLS ALL ABOUT
LOBDELL UNITED CO.'S "TOOL-DRESSING PACKAGE"

. . . and *now* is the time to ask for your copy of LOBDELL UNITED's new "Tool-Dressing Package" Bulletin. Why? . . . because we know that you'll be readily interested in a proposition that can save you up to 60% of your costs for cutting and chipping tools.

How is this possible? Well, we've prepared a "*Package*" of equipment and supporting data, which includes all of the Forging, Heat Treating and Dressing Equipment . . . plus the practical methods you need.

The popular NAZEL Electro-Pneumatic Forging Hammer is our product . . . for the rest of the "Package" we are joined by such outstanding firms as: Eclipse Fuel Engineering Co., the Black and Decker Co. and Bedford Tool and Forge Co. . . . But, allow us to give you the complete, money-saving facts in our "Tool-Dressing Package" Bulletin!

1836 **LOBDELL UNITED COMPANY** 1953
WILMINGTON 99, DELAWARE
A SUBSIDIARY OF UNITED ENGINEERING AND FOUNDRY COMPANY

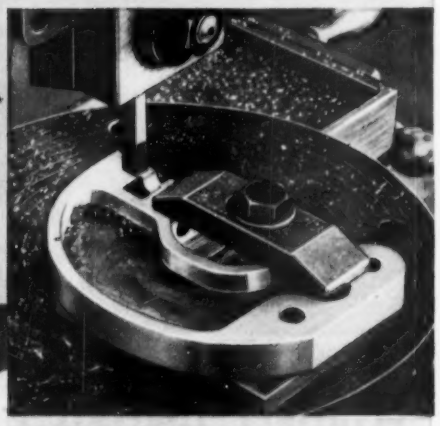
Awkward OPERATIONS NO PROBLEM ON

DECKEL UNIVERSAL MILLERS

Taking a heavy cut
on Model FP1 Universal Miller

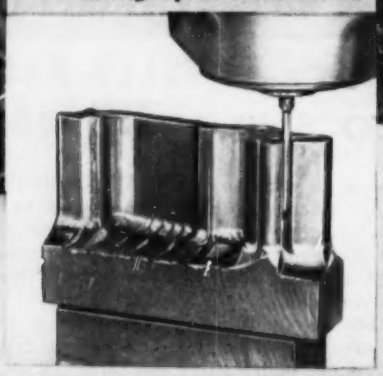
A DECKEL Miller is the "TOOL FRIDAY" that is always ready and able to machine those awkward jobs—accurately, quickly, and economically. Truly universal, this machine permits you to perform horizontal, vertical, angular, or spiral milling—drilling—boring or slotting on any shape or form. Outstanding performance plus simplified set-ups, adaptability, versatility, and ease of operation combine to make the DECKEL Universal Miller an essential "TOOL FRIDAY" in any plant.

Shaping with
Vertical Slotting Attachment



Finish Milling a punch
for typewriter parts

Milling a punch for typewriter parts with Single-lip Cutter held in High-speed Vertical Head



See why you should use DECKEL Millers, write for catalog or ask for a Cosa engineer to explain the many advantages to you.

Other Deckel Machines for Tooling & Production

2 DIMENSIONAL ENGRAVERS
3 DIMENSIONAL ENGRAVERS
UNIVERSAL PANTOGRAPH DIE SINKER
UNIVERSAL TOOL & CUTTER GRINDERS

COSA CORPORATION

405 Lexington Ave., New York 17

Source for all Precision Machine Tools—from Small Bench Lathes to Large Boring Mills

IN DETROIT AREA contact DETROIT-COSA CORPORATION, 16923 James Couzens Highway, Detroit 35, Mich

Cylinder gears—ground on a Reishauer ZA.

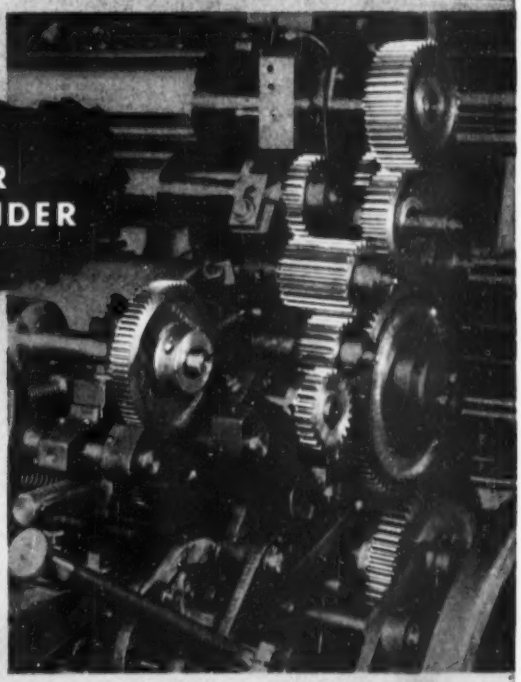
PRECISION GEARS...

the heart of fine printing presses...

are ground by AMERICAN TYPE FOUNDERS

on a

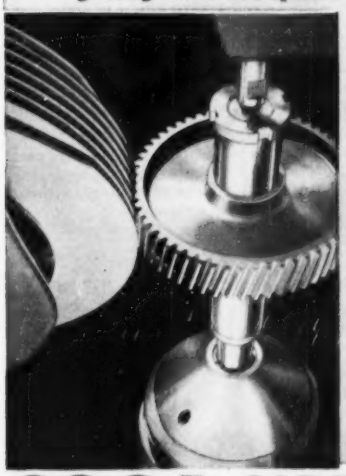
REISHAUER ZA GEAR GRINDER



Gear train on an ATF Press—ground on a Reishauer ZA.

Precision gears in a printing press are important, but cylinder gears on the ATF Chief are vital—they, in particular, must be accurately ground to prevent gear streaks on printed material, and they must be durable, to provide long-term accuracy. Therefore, ATF makes these gears from hardened alloy steel and precision-grinds them on the Reishauer ZA.

Heart of the Reishauer ZA—grinding wheel and spindle.



ATF is not alone in its respect for Reishauer's speed and accuracy—this machine is widely used to grind spur and helical gears in the automotive, aircraft, machine tool, gear-jobbing, and instrument industries.

Why is the Reishauer ZA so widely used? For one thing, it combines accurate grinding with production speed. For instance, floor-to-floor grinding time, on pre-hobbed gears, is about 8 to 13 seconds per inch-tooth.

There are many other reasons why the Reishauer ZA is the best production gear grinding machine you can get. If you want proof, we'll be happy to supply it. Get in touch with us soon, won't you?

COSA CORPORATION

405 Lexington Ave., New York 17

Your source for all Precision Machine Tools—from Small Bench Lathes to Large Boring Mills

IN DETROIT AREA contact DETROIT-COSA CORPORATION, 16923 James Couzens Highway, Detroit 35, Mich.

SLITTING DISCS
ANGULAR TOOTH SAWS
COMBINED DRILLS & COUNTERSINKS
SOLID TUNGSTEN CARBIDE COMMUTATOR SLOTTING SAWS
C.T. CO. INC. PROV. R.I. H.S.S.
C.T. CO., INC. T.C.
® METAL CUTTING TOOLS
For 30 years, we've turned out fine circular metal cutting tools. We've kept up with every advance — and we're ready now to meet the needs of tomorrow's more fully automatic production machines.
Circle R tools are made in a wide range of most-used sizes — and special sizes or designs will be made up promptly on your order. Write for details, or look us up in the phone book and talk with our nearest representative.
CHICAGO CLEVELAND DAYTON DETROIT BURBANK MILWAUKEE NEW YORK CITY
R 30 YEARS
INDIANAPOLIS PITTSBURGH PHILADELPHIA PHOENIX ROCHESTER ST. LOUIS GREENVILLE
PROVIDENCE 3, R. I.
CIRCULAR TOOL CO., INC.
METAL SLITTING SAWS
SCREW SLOTTING SAWS
COPPER SLITTING SAWS
COMMUTATOR SLOTTING SAWS
JEWELER'S SLOTTING SAWS
TUBE CUT-OFF SAWS
SLITTING DISCS • SOLID & TIPPED TUNGSTEN CARBIDE SAWS • COMBINED DRILLS, COUNTERSINKS & CENTER REAMERS

Cost-cutting ideas for you . . .

HOW FORD AUTOMATES PRODUCTION LINES

Copies available at 25 cents each
Reader Service Department

American Machinist
McGraw-Hill Building, New York 36, New York

INTERNAL THREADING TOOLS for PRECISION THREADING

FOR HOLES FROM 1/16" UPWARD
17 DIFFERENT SIZES
MADE OF SUPER-HIGH-SPEED STEEL SPECIALLY TREATED
(Available in Carbide)
- CONSTANT SHAPE AND CLEARANCE
- EASY RESHARPENING
- CONVENIENT TO USE - LONG LIFE

Write For Complete Data

Dealers! Here's a Profit-Maker!

COMET Tool Co.
738-AM Broadway
New York 3, N. Y.

PUMP GUIDE

for Maintenance Men...

NEW CATALOG ON

TUTHILL MODEL CK HIGH-PRESSURE PUMPS

NOW READY TO HELP YOU

This concise book gives you types and sizes of Tuthill High Pressure Pumps to meet any requirement for hydraulic service where the operating pressure does not exceed 400 p.s.i. Included is data on the following types in capacities from 5 to 200 g.p.m.

MODEL CK—Compact, self-priming, uni-directional. Spring-loaded packing. Direct drive or belted units.

MODEL CKB—Same as Model CK, with dependable Tuthill mechanical shaft seal.

MODEL RCK—Includes Tuthill's exclusive automatic reversing feature. Available also with mechanical seal as Model RCKB.

Write for Tuthill Catalog No. 103 today.

TUTHILL PUMPS FOR ANY PURPOSE

TUTHILL PUMP COMPANY
Dependable Rotary Pumps since 1927
939 East 95th Street, Chicago 19, Illinois

Canadian Affiliate:
Ingersoll Machine & Tool Company, Ltd.
Ingersoll, Ontario, Canada

self-locking fasteners

Elastic Stop nuts

HEX NUT

SPLINE NUT

HIGH TENSILE NUT

CLINCH NUT

1200° F. HIGH-TEMP. NUT

GANG CHANNEL NUTS

FLOATING ANCHOR NUT

Every major aircraft now being assembled relies on the vibration-proof holding power of ELASTIC STOP nuts. Only ESNA manufactures a complete line of all types and sizes of self-locking nuts.

Rollpins

dia. from 1/16" to 1/2"

Rollpins are slotted, tubular steel, pressed-fit pins with chamfered ends. They drive easily into holes drilled to normal tolerances, compressing as driven. Extra assembly steps like hole reaming or peening are eliminated. Rollpins *lock* in place, yet are readily removed with a punch and may be reused.

Cut assembly costs by using Rollpins as set screws, positioning dowels, clevis or hinge pins. Specify them in place of straight, serrated, tapered or cotter type pins.

ESNA TRADE MARK

ELASTIC STOP NUT CORPORATION OF AMERICA

ROLLPIN TRADEMARK

Mail Coupon for Design information

Elastic Stop Nut Corporation of America
Dept. N34-119, 2330 Vauxhall Road, Union, N. J.

Please send me the following free fastening information:

- ☐ Elastic Stop Nut Bulletin
- ☐ Rollpin Bulletin
- ☐ AN-ESNA Conversion Chart
- ☐ Here is a drawing of our product. What fastener would you suggest?

Name_____ Title_____

Firm_____

Street_____

City_____ Zone____ State_____

production begins with

Columbus Die-Tool

It takes the right machinery to build your product right! Columbus Die-Tool individually designs and builds tools, dies, and special machinery to produce your product alone. This gives you the advantages of lower operating cost, greater production and a higher quality product.

Let Columbus Die-Tool's more than 46 years of designing and engineering experience go to work for you. Contact CDT today about your special die, tool and machinery requirements.

Columbus Die-Tool
AND MACHINE COMPANY
P. O. BOX 750 • COLUMBUS, OHIO
ESTABLISHED 1906

Manufacturers of
JIGS • FIXTURES • BUILDING MACHINE TOOLS COMPLETE
SPECIAL TOOLS • UNITS FOR MACHINE TOOLS

INDIVIDUAL VULCANAIRE
DUST COLLECTING UNITS

They are used on surface and other grinders where grinding dust must be removed.

Inexpensive, compact units, with no moving parts. Operated from your present air supply.

Installed in a few minutes, eliminating need for costly centrally located dust collecting systems.

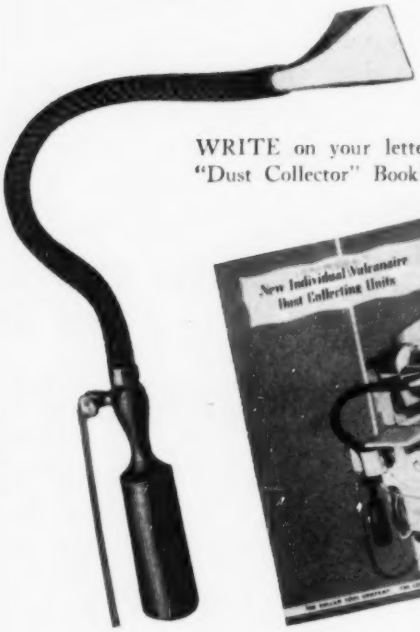
The collector element is mounted on the side of the machine. Quickly cleaned, requiring no refills.

Vac-suction pick-up device (vacuum nozzle) is mounted on the grinding wheel guard or close to grinding wheel on other applications. This mounting permits constant contact with dust as the wheel is moved up or down.

A simple needle valve operates the unit, and can be shut off whenever the machine is not in use.

Available in 700 series for grinding wheels 7" dia. or less.

Made by the makers of Vulcanaire The jig grinding attachment.



WRITE on your letterhead for "Dust Collector" Booklet.

VULCAN TOOL CO.
788 LORAIN AVENUE DAYTON 10, OHIO

HEPBURN OF CANADA SUPPLIES MACHINE TOOLS TO U.S. INDUSTRY

Specialists in turning and boring machines

American mass production engineers have endorsed the use of Hepburn Single Purpose machines in the manufacture of parts required in continuous volume. Today, our machine tools are in constant use throughout the States!

THE HEPBURN SUCCESS BACKGROUND RELIES ON

1. Specialized long term experience of turning and boring applications
2. Concentration on the machining of parts for continuous volume production
3. Low capital investment and low installation cost
4. Simplicity of design and ease of operation
5. Dependability and minimum maintenance
6. Short term delivery

Heavy areas indicate surfaces machined

Hepburn Single Purpose Machine Tool for recessing valve blanks, made for Thompson Products, Inc., Cleveland, Ohio

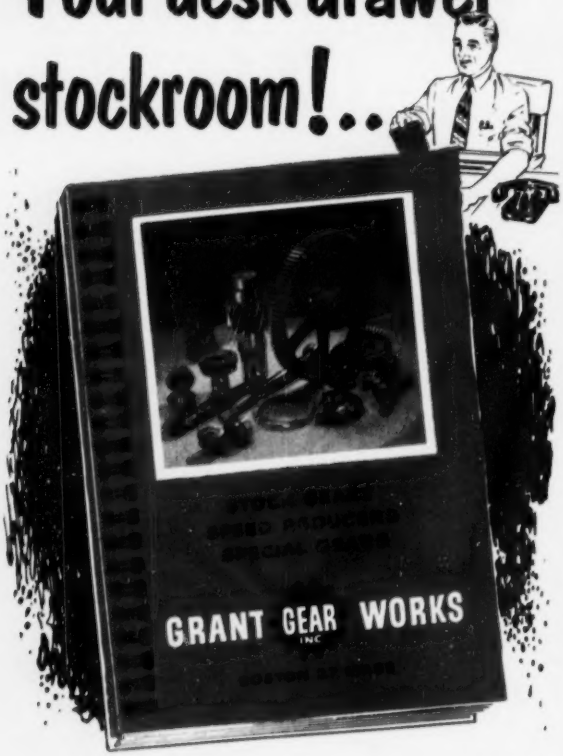
John T. Hepburn, Limited

Machine Tool Division **Toronto, Canada**

Call your U.S. Representative:

Allen Machinery Corporation
104 South Michigan Avenue
Chicago 3, Illinois
Randolph 6-1047

Your desk drawer stockroom!...



Yes, you can keep your stock of gears right in your desk drawer. It's simple with the new Grant catalog. There's no need of *carrying* a large inventory of gears *on hand* when you can find what you need at Grant—with delivery made to fit your schedule.

Whether it's gears, sprockets, or speed reducers, you'll find what you need in this new catalog. Better get a copy for your desk drawer now.

Custom Gears?

You can depend on over three-quarters of a century of Grant experience to produce custom gears to your specifications.

GRANT GEAR WORKS, INC.

169 W. Second St.
So. Boston, Mass.

Please rush the new, indexed Grant catalog for my desk

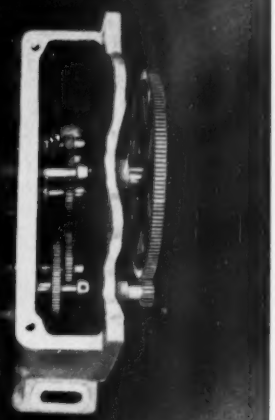
Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____

GEARS
IN QUANTITY PRODUCTION



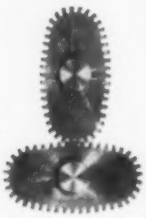
Territories Available for Sales Representatives

We specialize in quantity gear production for manufacturers. A complete plant with over 100 machines in continuous production.

ACME GEAR COMPANY
5-17 47th ROAD, LONG ISLAND CITY 1, N. Y.

BILGRAM TRADE MARK

OVAL GEARS



ALSO:
GEARS OF ALL TYPES and MATERIALS...

produced promptly in ANY QUANTITY

BILGRAM GEAR & MACHINE WORKS
1217-35 Spring Garden, Philadelphia, Pa.

Every Punch Press Operator *Needs* the "Safety" of a **SAFEED** Patented

PREVENTS INJURY — SAVES GLOVE COSTS

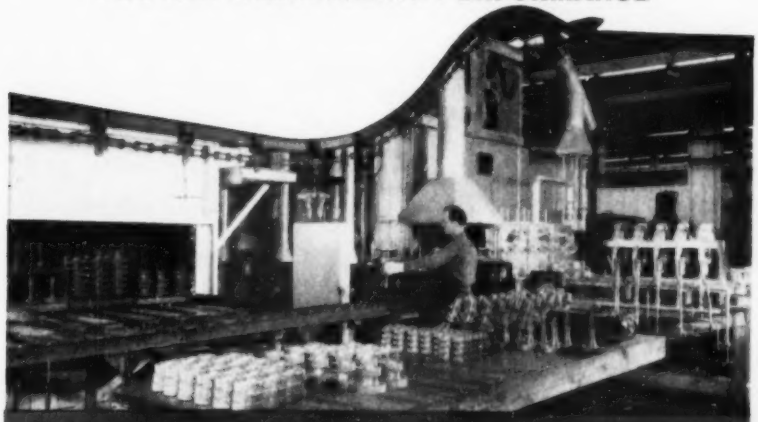
Feeds ferrous, non-ferrous strip or sheet . . . faster, safer. Use for stamping, shearing. Right or left hand non-slip fitted grip, self-adjusting. Sturdy, hardened work surfaces. FULLY GUARANTEED.

Write today
Early delivery.

AFFILIATED MACHINE & TOOL CO.
260 WEST ST., NEW YORK 13, N. Y. CAnal 6-4937

FORECASTS

FOR GAS CARBURIZING PERFORMANCE



You'd be amazed (as we are sometimes) at the long memories possessed by some of our furnace engineers. On short notice they'll give you the serial number, location and performance data on furnaces that we installed as long as 10 or 15 years ago — and they're generally right. The point is, the best way to forecast the performance of a furnace not yet built is to check thoroughly the records of similar installations.

BASED ON 22 YEARS OF "HINDSIGHT"

We have built hundreds of gas carburizers for all types of production requirements. If you are interested in continuous gas carburizing for instance, we can point to the first installation of its kind in 1931. It's still doing a job as reported in our sixteen-page bulletin, SC-134, an important and valuable review of gas carburizing techniques and possibilities. Write for it, on your letterhead please.

Current 'Surface' Literature

YOURS FOR THE ASKING

You may find quick answers to your immediate heat treat problems in these recent Surface Combustion Technical Library publications. Ask for the ones most pertinent to your requirements and we'll send them promptly.

bulletins

SC-134	Modern Gas Carburizing
SC-158	RX Prepared Atmosphere Generator
SC-155	Prepared Gas Atmospheres
SC-149	Pit Type Controlled Atmosphere Furnaces
SC-147	Rotary Retort Controlled Atmosphere Furnaces

reprints

53-A	Pit Type Carburizing Furnaces Provide Flexible Setup
52-C	Continuous Carbon Restoration Furnace Boosts Production
49-E	Furnaces for Gas Carburizing
49-B	Homogeneous Carburizing
47-E	Influence of Water Vapor on Gas Carburizing Atmospheres

SURFACE COMBUSTION CORPORATION, TOLEDO 1, OHIO

ALSO MAKERS OF

Kathabar HUMIDITY CONDITIONING

Janitrol AUTOMATIC SPACE HEATING

Surface

HEAT TREATING EQUIPMENT

DO MORE...

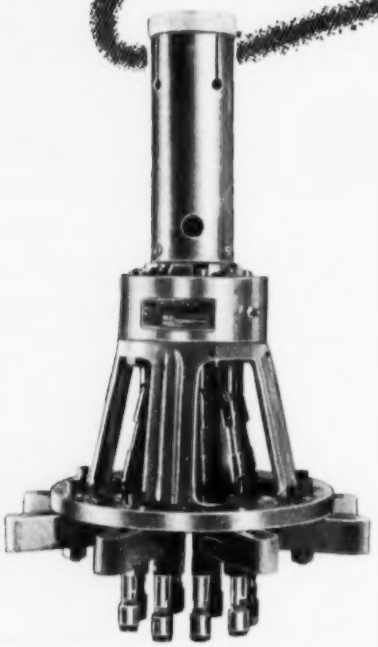
DO IT BETTER

DO IT FASTER

ERRINGTON

UNIVERSAL JOINT DRILLING & TAPPING HEADS

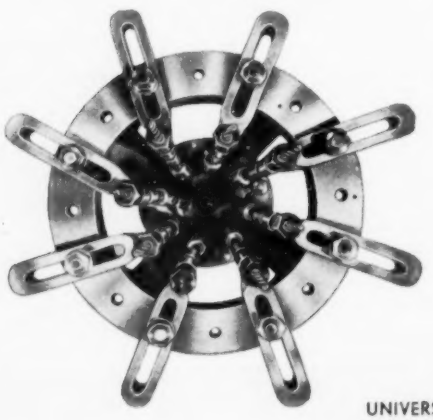
Another pair of hi-speed production tools from Errington—Universal Joint Drilling and Tapping Heads. These dependable tools are adjustable to any pattern of holes . . . are available with 4 to 12 spindles. Heads made of the best grade sand Cast Aluminum with hardened and ground gears and spindles (made in one piece). Full grooved ball thrust bearings at all thrust points and Oilite bronze radial bearings. Remember to do more . . . better . . . faster . . . rely on Errington Hi-Speed Production Tools.



UNIVERSAL JOINT TAPPING HEAD

#0—0" to ¼" Tap Capacity 4 Spindles.

#1—7/32" to ⅜" Tap Capacity 4 Spindles.



UNIVERSAL JOINT DRILLING HEAD

#0—0 to ¼" Full range of collets furnished.

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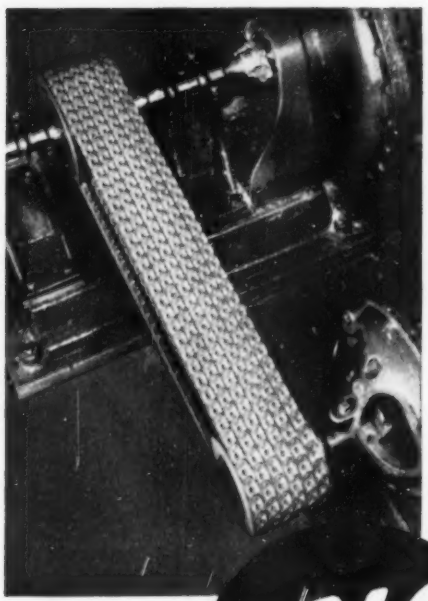

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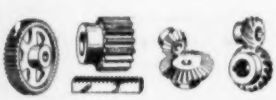

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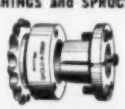

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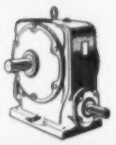

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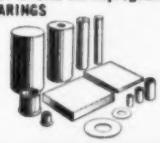

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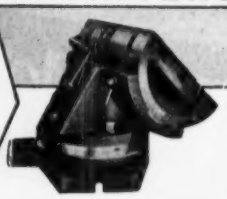

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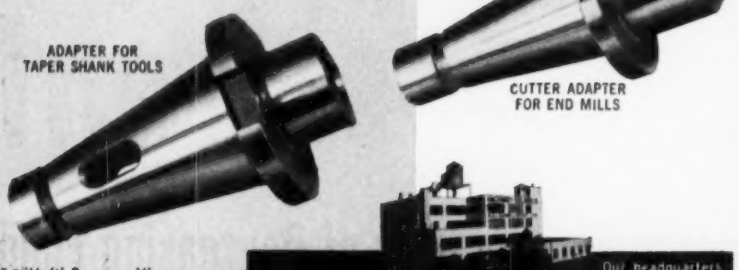

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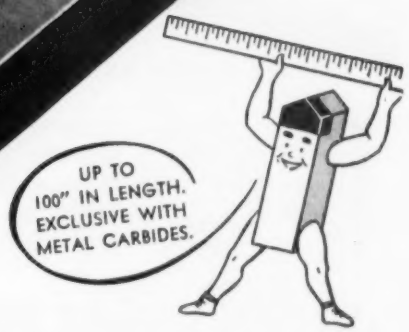

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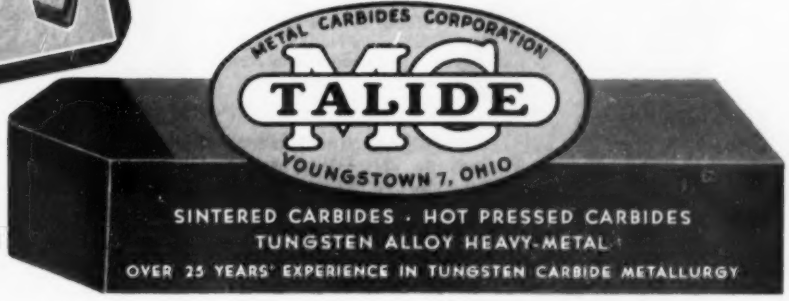

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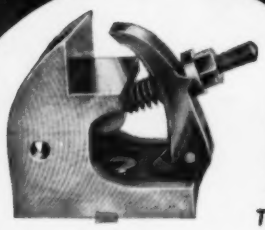

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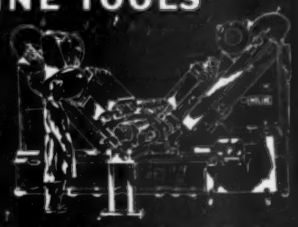

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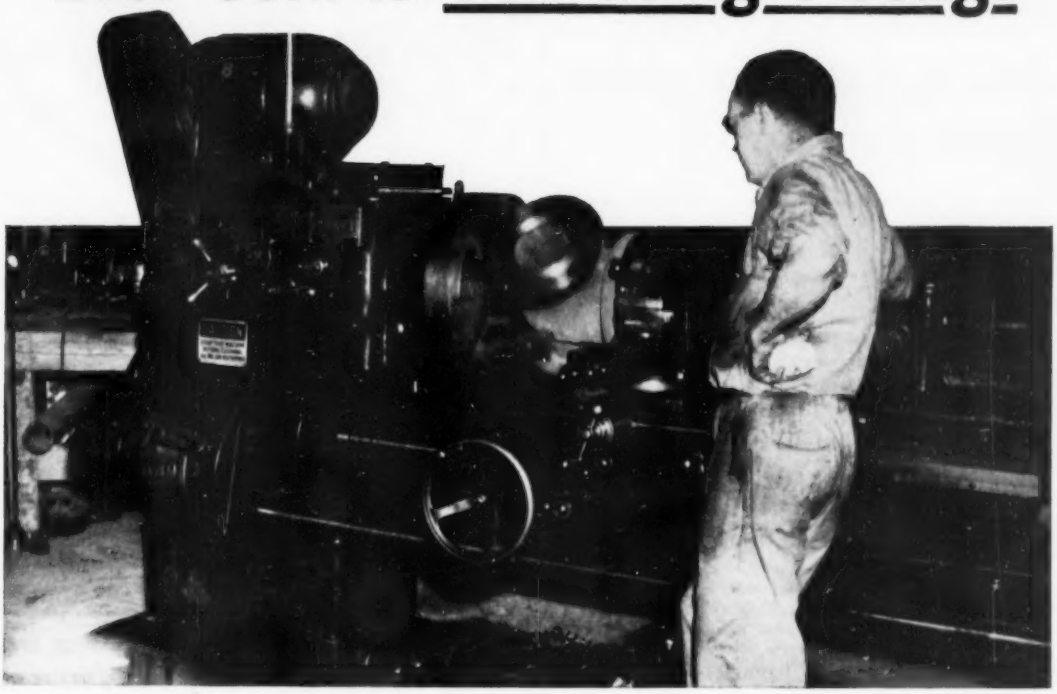

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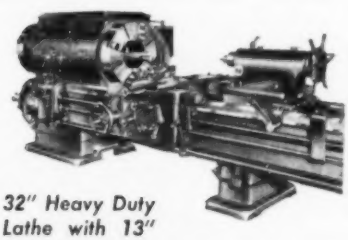

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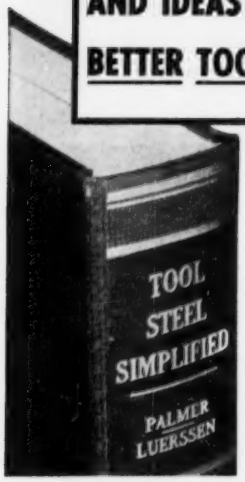

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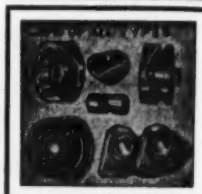

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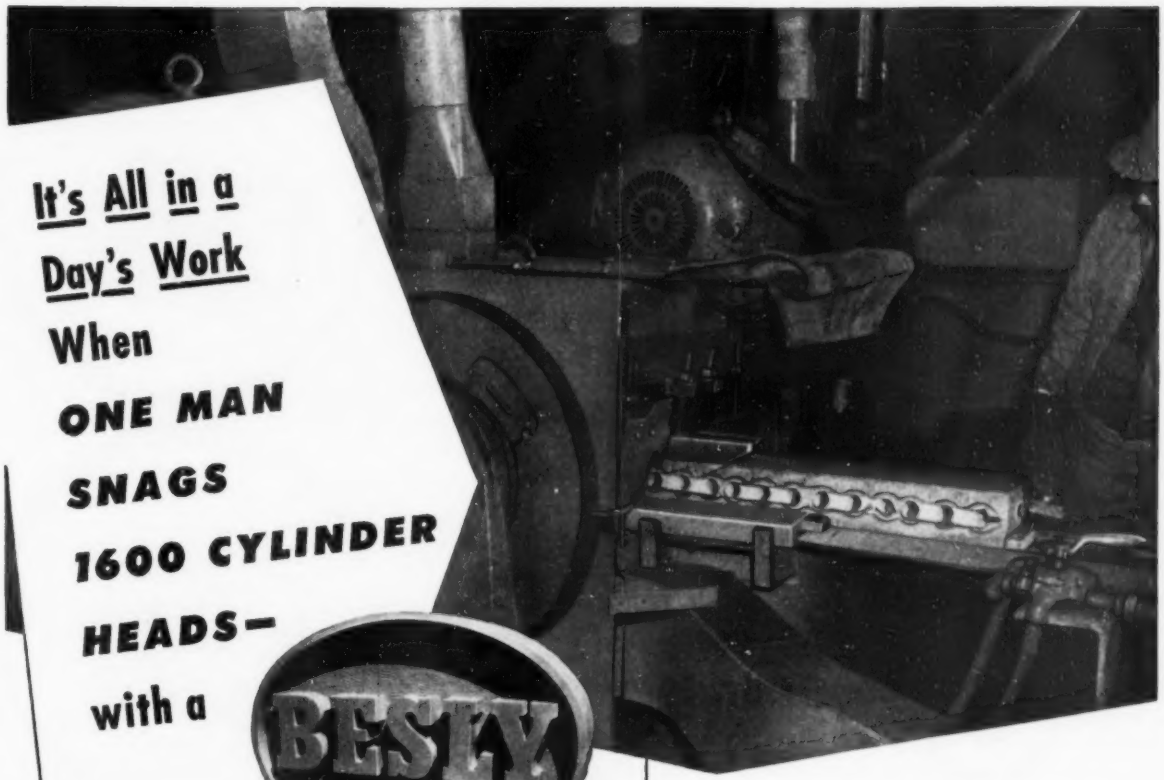

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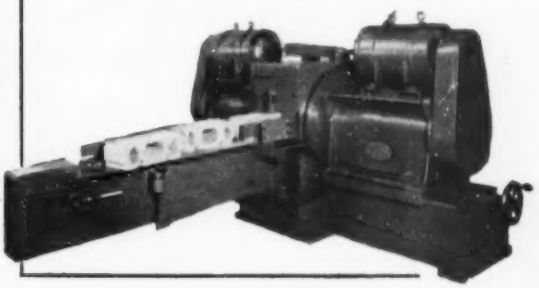
With changes in fixturing, the Besly No. 630 Grinder can be adapted to a wide variety of grinding operations, one of which may well speed and simplify your manufacturing process. Ask your Besly representative about this and other cost-cutting Besly Grinders for all needs!

ABOVE: No. 630-30" Besly Double Spindle Dry Grinder set up to grind cylinder head castings. Two 30" x 2" x 6" Besly-Titan Steelbac Abrasive Discs are driven through multiple vee-belt transmissions by two 25 HP, totally enclosed, fan-cooled, ball-bearing motors. Equipped with special exhaust hood and swinging arm wheel truing device. The continuous chain feeding fixture is motor driven through a worm and worm gear reducer. Special guide plates and spring-loaded hold down shoes accommodate the various castings.

BELOW: Besly No. 630 Grinder fixtured for smooth-surfacing tops and bottoms of concrete blocks.



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CORPORATION

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CHARLES H. BESLY & CO.
120 Dearborn Ave., Beloit, Wis.

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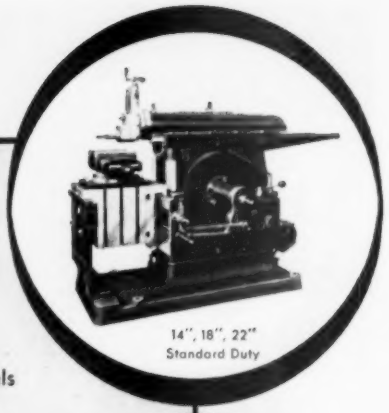
VMA ... the finest in shapers!

Superb Swedish craftsmanship, plus fine design and construction backed by 50 years' experience, makes the VMA line of shapers outstanding production and tool room machines. Three sizes, in both the standard and heavy-duty models, cover a wide range of machining requirements. Simplified controls are grouped conveniently for the operator. Both standard duty and heavy duty models provide a generous selection of speeds and feeds. Table power rapid traverse is standard on heavy duty models. A rugged, swivel-base vise, motor and starter are standard equipment. You will be pleased with the modest prices and early delivery dates.



14", 18", 22"
Standard Duty

18", 22", 26"
Heavy Duty

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Look for the Austin Seal — your full guarantee of satisfaction!

From the *American Machinist* Library of *Tips for Top Shop Men*

ONE old-time shop manager, taking over from a tough and unapproachable predecessor, changed the atmosphere completely by saying: "When you have a problem, come in and see me. There's no frost on my doorknob!"

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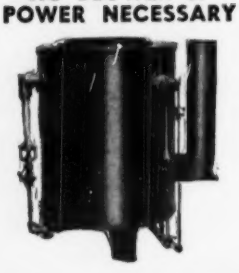

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Just connect to your gas supply and this BUZZER Atmospheric Pot Furnace is ready for operation. An innovation in design they are unbeatable for salt bath or lead hardening. Even heat, close control, high efficiency are only few of the many features. Available in many sizes.

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121 South Grand Avenue, Baldwin, L. I., N. Y.

Clark ADJUSTABLE HOLE CUTTER

Finished cuts the first time in boiler plate, plastics, hard fibre, pipe, stainless steel, Transite, etc. 7 models cut variable expansions from ⅜" to 5" holes, with thickness capacities from thin sheets to 1".

SPECIFICATIONS

MODEL NO.	SHANK SIZE	EXPANSION CAPACITY	THICKNESS CAPACITY
00	½" SS	⅜"– 1¼"	⅛"
0	½" SS	⅝"– 1½"	⅛"
1	½" SS	1"– 2½"	⅛"
2	2 MT	1½"– 3"	¼"
3	2 MT	2"– 3½"	⅜"
4	4 MT	3½"– 4"	½"
5	4 MT	3"– 5"	1"

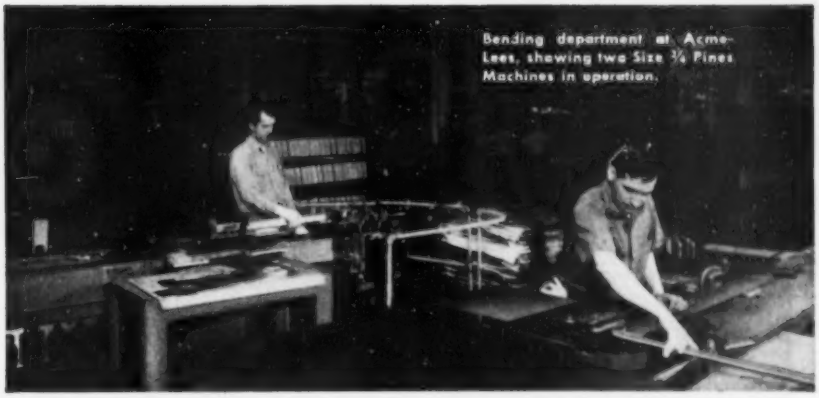
For Complete Information Call Your Clark Cutter Jobber or Write Factory A

CLARK CUTTERS
Robert H. Clark Company
9330 SANTA MONICA BLVD · BEVERLY HILLS · CALIFORNIA

TRIM MOLDINGS PRODUCED 58% Faster

AT
ACME-LEES DIVISION
ON

PINES SIZE 3/4 AUTOMATIC BENDERS



Bending department at Acme-Lees, showing two Size ¾ Pines Machines in operation.

◀ Tooling for compression-bending stainless steel trim strips. First and fourth bends are located from a hinged stop on the swinging arm; second and third, from stops on top of machine.

◀ Tooling for draw-bending brass trim molding to 85° on a 1⅜" radius. Three different sizes of molding are handled with this same tooling by simply adjusting the distance between bends.

SKILLFUL TOOLING PRODUCES SMOOTH 1½" RADIUS BENDS IN .020" TYPE 430 STAINLESS STEEL

Here's a typical result story indicative of the bending skill of Acme-Lees Division, Muncie, Indiana, specialists in fabricating decorative trim moldings and extruded shapes for Appliance and Automotive Manufacturers. On a Size ¾ Pines Automatic Bender, .020" Type 430 stainless steel trim moldings are now formed with four unusually smooth 90° bends to a 1½" radius. Production speed is today 58% faster than by former manual bending methods. Current production is rated at 456 bends per hour as compared to 288 by manual methods.

HYDRAULIC ACTUATION REDUCES SCRAP LOSSES

As shown, the tooling is accurately machined to fit the shape of the delicate molding. A bronze wiper shoe eliminates marring the exterior finish. The operator simply positions the workpiece and starts the hydraulic clamping and bending cycle by push button. The uniform, dependable hydraulic stroke of the Pines Bender assures fast, accurate bends which reduce scrap losses and simplify assembly problems.

INVESTIGATE PRODUCTION BENDING

If you have bending work with tubing, pipe, bars, extruded or rolled shapes, it may pay you to tool for production bending the "Pines-Way". Pines engineers will work with you on any bending problem without obligation.

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Specialists in Tube Fabricating Machinery · 672 WALNUT • AURORA, ILLINOIS

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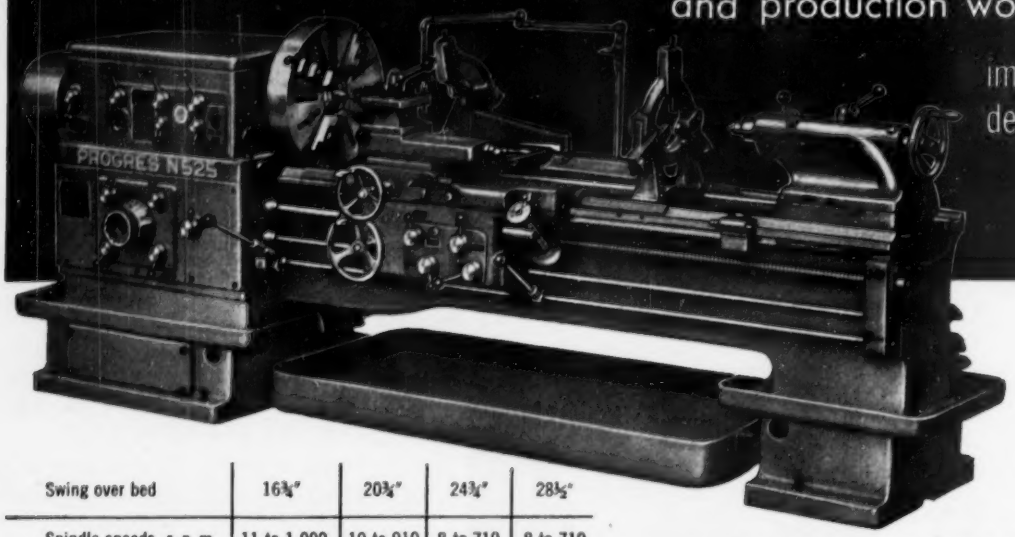

Swing over bed	16¾"	20¾"	24¾"	28½"
Spindle speeds, r. p. m.	11 to 1,000	10 to 910	8 to 710	8 to 710

Over 100 put in operation in the U. S. A. last year.

write or phone for full details

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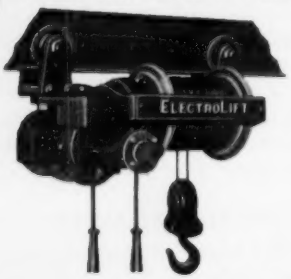
10 advantages of ELECTROLIFT WORM DRIVE HOIST



- automatic electric brake
- motor hoist fully enclosed
- hoist gearing fully enclosed
- worm load brake holds load
- no overhung gears
- hoist drum fully grooved
- automatic lubrication
- worm shaft alloy steel
- drum guards protect cable
- optional pushbutton control

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Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY

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The *Scleroscope* is the only hardness tester that takes in the entire range from the softest to the hardest metals without any adjustments.

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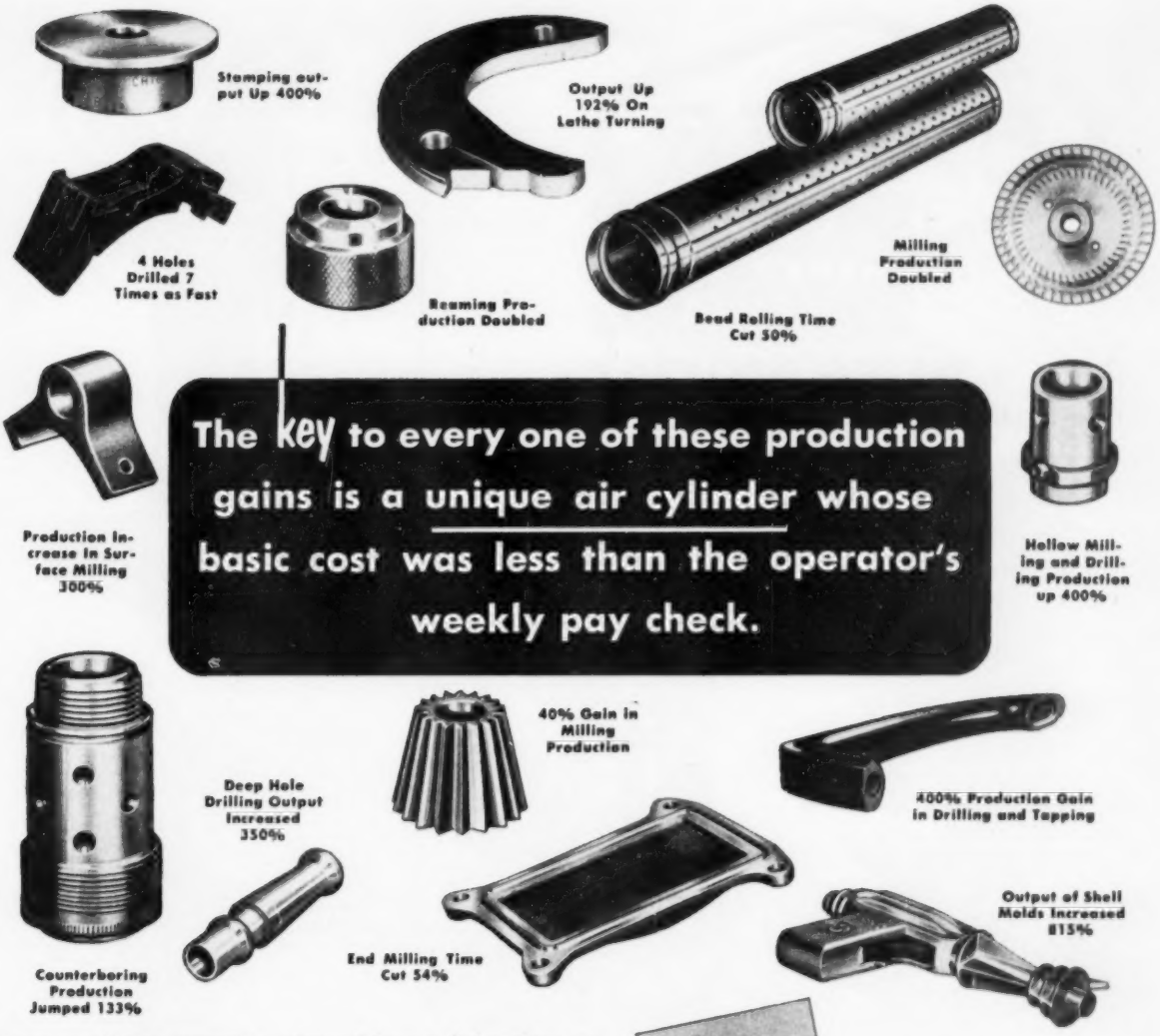
Stamping output Up 400%
Output Up 192% On Lathe Turning
4 Holes Drilled 7 Times as Fast
Reaming Production Doubled
Bead Rolling Time Cut 50%
Milling Production Doubled
Production Increase In Surface Milling 300%
Hollow Milling and Drilling Production up 400%
40% Gain in Milling Production
Deep Hole Drilling Output Increased 350%
400% Production Gain in Drilling and Tapping
Output of Shell Molds Increased 813%
End Milling Time Cut 54%
Counterboring Production Jumped 133%

The key to every one of these production gains is a unique air cylinder whose basic cost was less than the operator's weekly pay check.

Every machining operation pictured here is being done on inexpensive, shop built, special purpose machines. Designed either by the companies' own engineers or by a Bellows Field Engineer, the machines were built from parts normally available in every tool room. But the heart of each machine — the thing that makes it tick — is one or more Bellows Air Motors — an air cylinder so different that it has sparked the creative imagination of tool engineers and production men in more than ten thousand plants.

This air cylinder, alone among all air cylinders made, combines the speed and flexibility of air, the sureness of electrical control, and, with the Bellows Hydro-Check control, the smoothness of hydraulics, all in one compact, packaged power unit.

Bellows Air Motors can be applied to hundreds of different standard machines to speed up feeding or ejection of parts; to feed tools faster, more accurately, safer; to permit relatively unskilled operators to turn out top quality work. They can be incorporated in special machines to perform any repetitive push, pull, lift or turn motion. The range of their usefulness is limited only by the ingenuity of the user.

813A

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Write for it *Today!*

Here in this fast reading 36 page bulletin is the dramatic story of Bellows Air Motors and other Bellows "Controlled-Air-Power" Devices. Packed full of design information, case history data, photographs and diagrams — information every man concerned with costs and production should have. It is free on request. Write — Dep't. AM1153, The Bellows Co., Akron 9, Ohio. In Canada, Bellows Pneumatic Devices of Canada, Ltd., Toronto.

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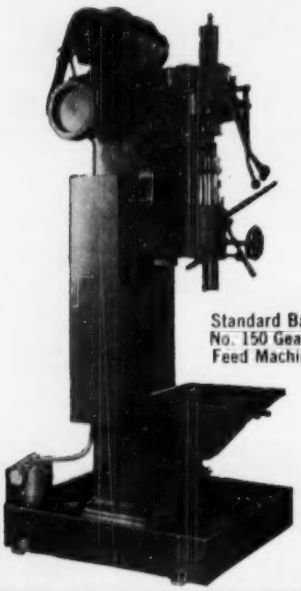
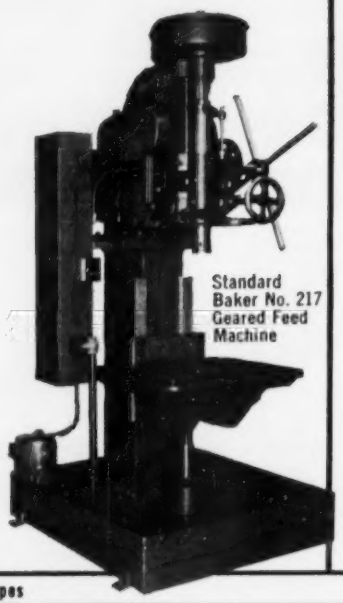
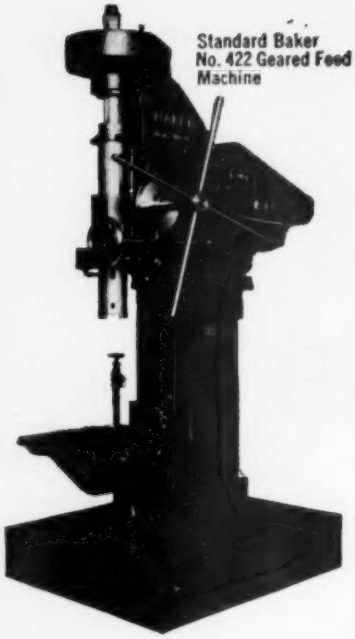


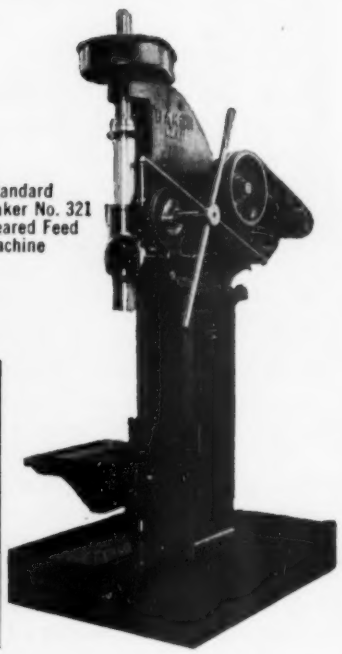
Standard Baker No. 150 Geared Feed Machine



Standard Baker No. 217 Geared Feed Machine



Standard Baker No. 422 Geared Feed Machine



Standard Baker No. 321 Geared Feed Machine

MAJOR SPECIFICATIONS—Single Purpose Types

	150	150 Q.C.†	217	321	422
1. Capacity—Max. Dia. Drill in S.A.E. 1035 Steel	1½	1½"	2	3	4½
2. Max. H. P. Motor used	7½	7½"	10	15	20
3. Distance center of Spindle to Frame (Gap)*	11"	11"	12¼"	12¼"	12¼"
4. Maximum Spindle Travel	11"	11"	12"	16"	16"
5. Spindle—Outside Dia. splined driving end	1¾"	1¾"	2"	2-13/16"	3¼"
6. Dia. of Spindle Sleeve	2¾"	2.750"	3¼"	4¼"	5¼"
7. Dia. of Spindle Nose	2.975	2.975"	.3225	4.225"	5.225
8. Morse Taper in Spindle as standard	No. 4	No. 4	No. 5	No. 5	No. 6
9. Standard Speed Range in R.P.M.	151-632	48-1120	76-614	27-220	20-165

* Can be increased 3" by use of offset Spacer Block. † Quick Change, 12 Speeds

Baker single purpose type drills are heavy duty . . . provide a wide range of speeds and feeds for Single and Multiple Spindle Drilling . . . Reaming . . . Boring . . . Facing . . . Chamfering . . . Undercutting and Tapping Operations. Write for full details.

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HIGH SPEED HYDRAULIC Copying Lathes *for every purpose!*

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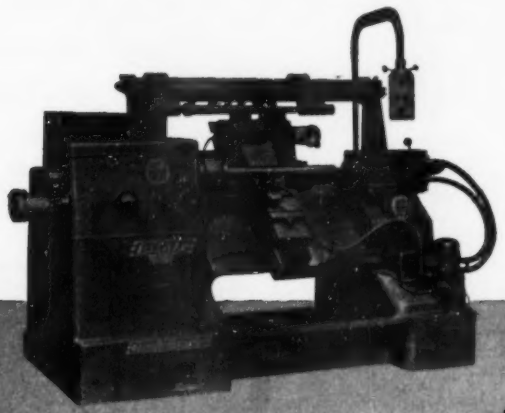
The greatest advance in turning methods since the development of carbide tools! Whether your production is on a large scale or you need short, economical runs, there is an H.E.B. Copying Lathe to fit the special needs of your operation.

Why use a dozen tools when the H.E.B. *with just a few* does the job faster, better and at less cost! Incorporating the patented H.E.B. tracer device these versatile machines give you maximum output at high speed with remarkable accuracy and finish.

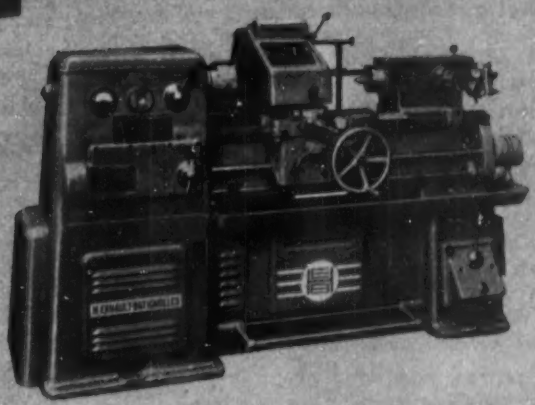


H.E.B. PILOTE COMPLETELY AUTOMATIC HYDRAULIC COPYING LATHE

The first *completely automatic* hydraulic copying lathe. The operator has only to load the machine and *press a button* to start the cycle. When the part is finished the tool returns to its starting position and the spindle stops automatically! Savings in setup time and tooling costs are enormous. Motors to 60 H.P.

COMPLETELY AUTOMATIC

SEMI-AUTOMATIC



H.E.B. HIGH SPEED HYDRAULIC COPYING LATHE

This absolutely rigid, chatter-free machine with built-in tracer device eliminates costly down time, takes no more than 10 to 20 minutes for setting up and the finished parts are copy turned up to 300% faster than on multi-tool lathes.

The OP Model, with its 20 H.P. motor, takes heavy cuts with carbide tools at spindle speeds 50 to 3600 RPM. GT Models with rotating pattern are designed to copy an infinite variety of non-circular work.

These machines are designed and built in France by H. Ernault Batignolles, machine tool manufacturers for almost a hundred years. If you want more information about tomorrow's turning methods, then write, wire or telephone now for a demonstration or catalog. See our insert in Sweet's Machine Tool Catalog.

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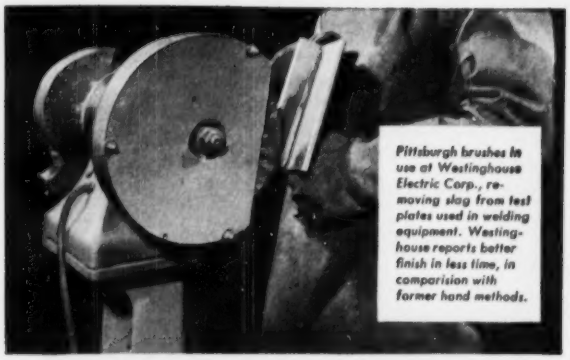


Pittsburgh brushes in use at Westinghouse Electric Corp., removing slag from test plates used in welding equipment. Westinghouse reports better finish in less time, in comparision with former hand methods.

Replace hand finishing with power-driven Pittsburgh Brushes for

Better Cleaning
Lower Labor Costs
Fewer Rejects

—as these companies did:

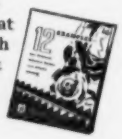
Removal of imbedded slag in welding test plates formerly was done by hand at the Westinghouse Electric Corp., Trafford, Pa., using a wire brush and welder's hammer. Pittsburgh brushes, powered by a direct-drive ½ h.p. motor, now remove more slag in less time, and produce a better finish. In addition, Westinghouse reports their Pittsburgh brushes "stand up better than average in use."

Complete cleaning of dried concrete, rust and scale from steel frames used in concrete forming is essential prior to re-using the forms. Pittsburgh wire brushes were installed at the Universal Form Clamp Co., Chicago. Working on a conveyor-fed machine, the Pittsburgh brushes now remove all foreign material at a rate of 50 pieces per hour, replacing former laborious hand brushing and scraping.

De-scaling preheated bar stock at the Dominion Forge & Stamping Co., Ltd., Canada, was formerly done by hand scraping. This never did a complete job, and inclusions resulted which produced defective forgings. Pittsburgh brushes, on specially-designed machines, now do the job, and have "increased efficiency, decreased the amount of scrap, improved work quality, and saved labor."

WRITE TODAY FOR FREE BOOKLET!

Write today for a free copy of our booklet that shows, through actual case histories, how Pittsburgh cuts brushing costs. Address: PITTSBURGH PLATE GLASS COMPANY, *Brush Div.*, Dept. W-9, 3221 Frederick Avenue, Baltimore 29, Maryland.



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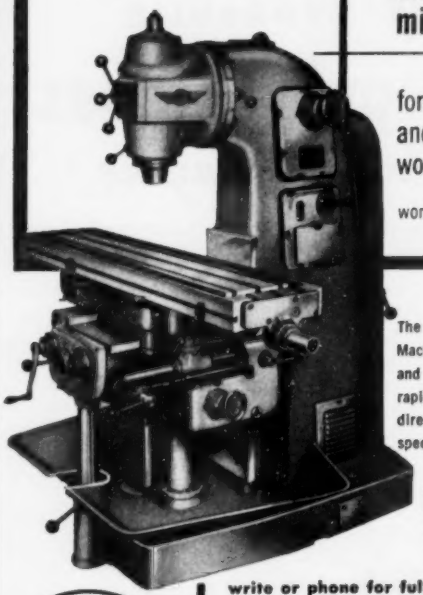
plain, universal and vertical **millers**

for tool room and production work

work table 12" x 51"



The #2 HERCULES Milling Machines have hardened and ground gears, power rapid traverse in all directions, 12 spindle speeds and feeds.

immediate delivery

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...for all BENCHMASTER HAND-SCREW MILLS!

$125.00 F.O.B. FACTORY

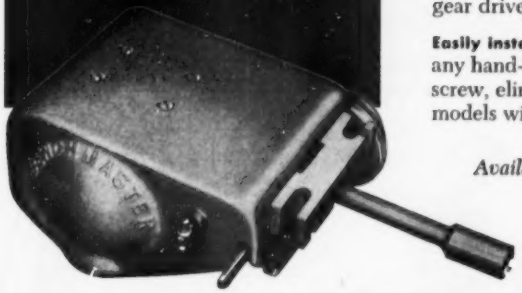
Complete, Ready to Install and Plug In

MOTOR: 1/15 hp, 110 V. AC 60 Cycle

MECHANISM: Bronze Gear, Steel Worm

WEIGHT: Approximately 10 lbs., Net

DIMENSIONS: 4½" x 5½" x 8", less connecting shaft.



Four speeds in either direction! 1.2, 2.1, 3.2, and 4.5 inches of table travel per minute...all independent of spindle speed and direction of rotation.

Powerful! Table drive equals or exceeds milling capacity of the spindle.

Table travel instantly reversible! Reversible motor and simple two-way switch instantly reverses direction of table feed. Adjustable stops limit table travel in either direction.

Doesn't interfere with manual operation! Lever quickly disengages worm gear drive, permitting use of ordinary hand feeds when desired!

Easily installed in 10-15 minutes! Two bolts secure unit to end of table on any hand-screw model. Slots in adapter permit easy alignment with lead screw, eliminate fussy hole location. (Note—not adaptable to production models with rack and pinion table feed.)

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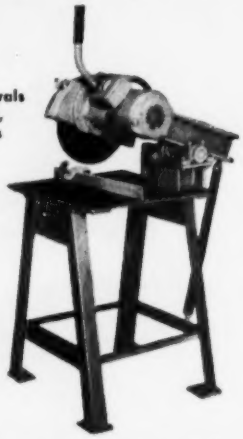
STONE Model M-35

12" Cut-Off Machine

For Ferrous and Non-Ferrous Metals

CAPACITY
Ferrous—1½" solids,
2½" O.D. pipe, 2½" structurals
Non-ferrous—2½" solids,
3" tubing and extrusions



PRICE
Completely Equipped
Ready for Cutting

$445

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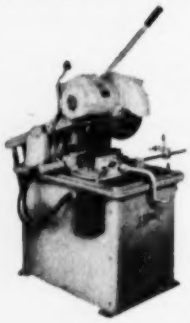
We are proud to present the newest member of our superior line of high speed cut-off machines. The M-35 has a full 3½ h.p. geared-in-head motor. The direct drive insures delivery of full power to the cutting edge. Result — faster cutting (3 seconds per square inch of metal) and greater wheel life.



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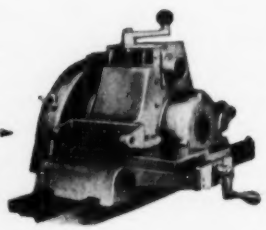
Full 7½ h.p. geared-in-head motor. Will cut all ferrous and non-ferrous solids up to 2½", pipe and structurals up to 4". Can be equipped for wet cutting.



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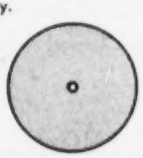

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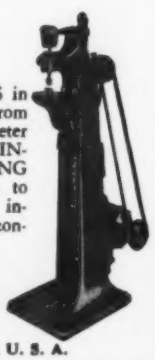

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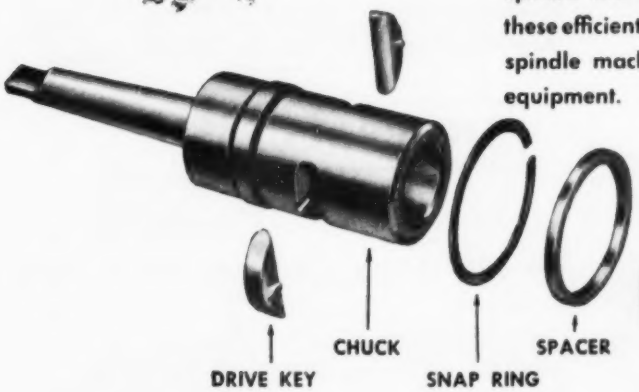
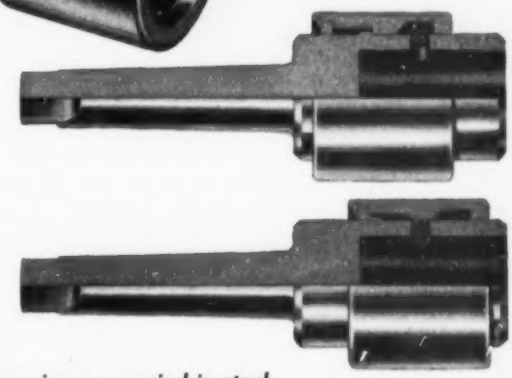


The three views show the construction of the Beaver Precision Collet (above), and the design of the Beaver Precision Rapid Drill Chuck (below).



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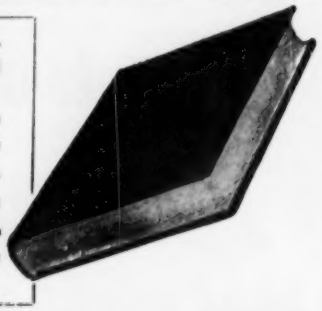

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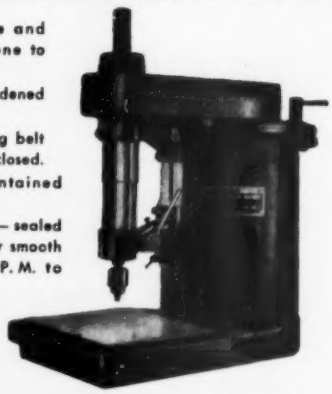

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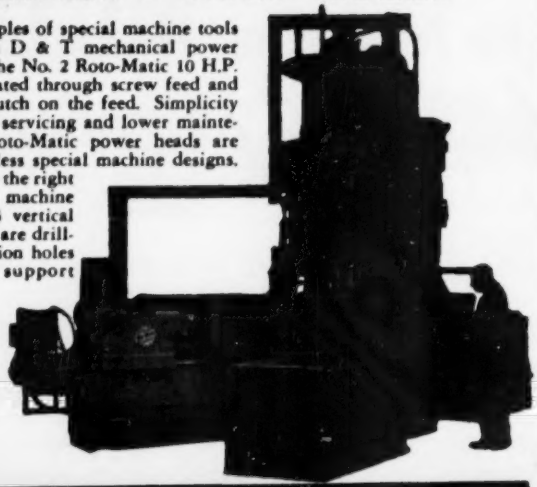

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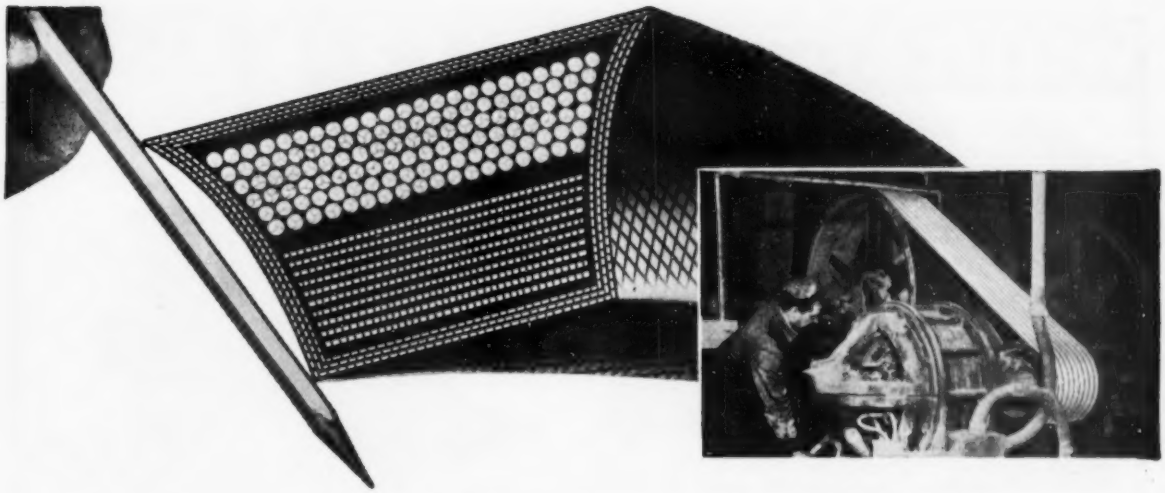

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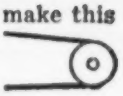

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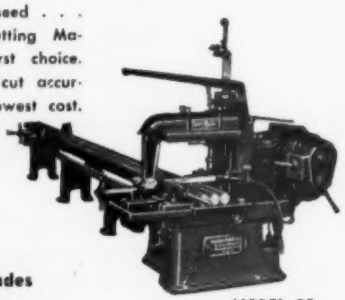

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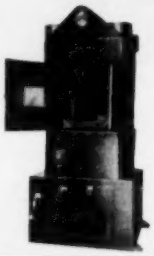

Capacity 3000 Tons — Platen Area 40"—Movable Top Head, Adjustable from 24" min to 48" max.—Approx $5000 worth of Tooling.

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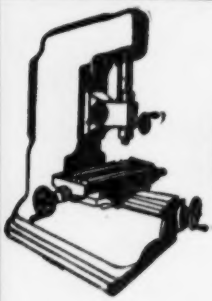

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Cochrane-Bly Model ±31—4" Automatic Sawing Machine. Entirely automatic. Hydraulic vise, automatic stock advance with rapid advance and rapid return of saw carriage. Adjustable carriage feeds from 0 to 15" per minute. Provision for semi-automatic operation. Vise capacity 4" with 16" saw blade.

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Gen. Elec., Industrial No. KX3, w/lead Lined Booths & Tube Col., New 1935.

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AUTOMATIC, #0 B & S Wire Feed Screw, Late.
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AUTOMATIC, #2 B & S Wire Feed, 1" screw. Cap.
AUTOMATIC, #4 Brown & Sharpe, M.D. Tooling

BALANCER, Andersen Bros. 14"x64", Rota-Checker.
BORING MILL, 36" Bullard M.D., V.T.L.
BORING MILL, 2¼" Lucas Horiz. M.D.
BORING MILL, Lucas Horiz., 3" Bar, M.D.
BORING MILL, Giddings & L #9 Horiz. 3½" Bar.
BORING MILL, 100" Niles B-P M.D. 2 swivel hds.
BARRELS, Tumbling Lupomatic, Schutte & Koerting.
BRAKE, #335 Chicago, M.D., Press 6', #538.
BRAKE, #185 Chicago Power Apron, 8'3/16" cap.
BROACH, La Pointe 5 ton, 36" stroke, #1 Late.

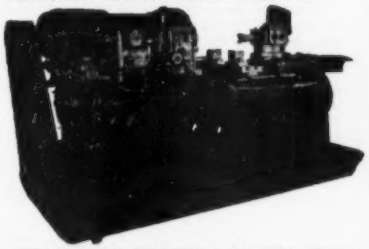
COMPRESSOR, Ingersoll Rand ER-1, 10 HP, M.D.
COMP., 15 HP, 10 HP, Gardner Denver, M.D., New.
COMPRESSOR, C-P 50 HP, M.D., 10x10, 278 CFM.
CRANE, OET Risker 2 tons 11'9" span.
CRANE, Canton #8 Portable Gooseneck 3 ton cap.

RADIAL DRILL, 3'9" Mueller, M.D.
RADIAL DRILL, 3'11" Canedy-Otto, M.D., Late.
RADIAL DRILL, 4'11" Cincinnati Bickford, M.D.
RADIAL DRILL, 5'13" Cincinnati-Bickford, M.D.
RADIAL DRILL, 6'15" Cincinnati-Bickford, M.D.
RADIAL DRILL, 30" Walker Turner M.D., Late.
DRILL, Fredick 16", S.S. Power Feed, M.D.
DRILL, #2 Colburn H.D. #4 M.T., M.D.
DRILL, #121 Baker Auto. S.S. Cam Operated.
DRILL, Deep Hole, Avey-Draulic #2 M.D.
DRILL, Edlund #2B, 3 spdle. #2 M.T., 16".
DRILL, 6 Sp. Avey 12" overhang, #3 M.T., M.D.
DRILL, Cincinnati 21" with Tapping Attach. M.D.
DRILL, 21" Cinci. Bick Super Serv. Box Col.
DRILL, Natco Multiple Spdle C5, 10 Sp. M.D.
DRILL, Natco Multiple Spdle #12, #1 M.T., M.D.
DRILL PRESSES, Leland Gifford #1MS, 1, 2, 3, 4.
DRILL PRESS, #2MS Buffalo Forge single spindle.
DRILL, Barnes, 24" S.S. #4 M.T., 1¾" cap.
DRILL PRESS, #25 Foote-Burt S.S. 24", #3 M.T.
DRILLS, #14, #15, #16, #18 Buffalo Forge, M.D.
DEEPFREEZE Motor Products 40 below zero.
DEMAGNITIZER, SB-911 Magnaflux, late type.

FACING HEADS, 29" & 24" Mummert-Dixon.
FILER, #11-S Cochrane Bly Auto Saw Filer.
FILER, Type P4 Oliver Floor Type, M.D.
FURNACE, Westinghouse Elec. 18 KW, 2100°F cap.

GRINDER, M.D. Sanford Surf. 6"x12" cap., New.
GRINDER, #1 Wilmarth Morman Hand Surf., 6"x12".
GRINDER, #2 Imperial Univ. Tool & Cutter, New.
GRINDER, #2 Brown & Sharpe Sur. 6"x18" cap.
GRINDER, #2 Cinci. Centerless Filmatic, Late Type.
GRINDER, #4 G & L Univ. Tool & Cutter, M.D.
GRINDER, Disc, Besly #205, 18" Dble End.
GRINDER, Heald Rotary #25, M.D. 16" Cap.
GRINDER, Cylindrical, Norton 10"x24", M.D.
GRINDER, Brown & Sharpe #4 Univ. 12"x60".
GRINDER, Thread, Jones & Lamson #TG-615, Late.
GRINDER, Heald #72A-5 Internal Size-Matic.
GRINDER, 14"x36" Pratt & Whitney Vert. Sur.
GRINDER, Pratt & Whitney 22"x84" Vert. Surface.
GRINDER, Greenfield #12 Int. Hydromatic, M.D.
GRINDER, Oliver Auto. M.D. Drillspointer, #51.
GRINDER, #33 Abrasive Vert. Auto. Surface, M.D.
GRINDER, #22 Heald Horiz. Rotary Surface, M.D.
GRINDER, Diamond Snagging 10 HP, 24"x4½".
GRINDER, Norton 6x18 Vert. Surface, Hyd. Late.
GRINDER, #60 & #70 Heald Internal.
GRINDER, Landis 6"x18" Hyd. Cyl. late type, M.D.
GRINDER, Sellers Type #1A Tool, 24" wheel.
GRINDER, 37" Wheel Dia. Osterholm Disc. 24" cap.
GRINDER, #79, 72" Gardner Vert. Spindle. Late.
GEAR LAPPER, #8LS, #13LSI Fellows, Outboard Supports, Detachable Laphead, Late.
GEAR SHAPER, Fellows #6 High Speed, M.D.
GEAR SHAPER, Fellows #7 High Speed, M.D.

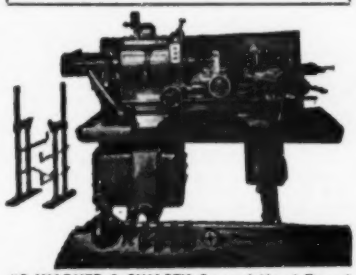
HAMMER, Rochester Hipped, all sizes, M.D.
HAMMER, Bradley 2002 Rubber Cushioned Helve.
HEADER, Manville #1 S.S.D.D. Cold 3/16".
INDUCTION HEATER, 16 KVA Ecco Hi Frequency.
IRONWORKER, 1½ Buffalo Forge Univ. 1951.
INDUCTION HEATER, 30 KW Lepel, Late Type.
AIR MOTOR HOIST, Ingersoll Rand 2000# cap.
ELECTRIC HOISTS, 500-4000 lbs. Whiting, NEW.
HONE, #194 Barnes Vertical, M.D., Hyd. Late.



4DE POTTER & JOHNSTON Automatic Turret Lathe, Motor Driven, T.E.F.C. 7½ HP. 3/60.220/440.

KEYSEATER, #5 Mitts & Merrill, Giant, M.D.
LAPPER, 2F Norton Vert., M.D., late type.

2—No. 7 BARDONS & OLIVER Geared Head
Full Universal Turret Lathe, Preselector Head. Bar Feed 2½" cap capacity through spindle. Late Type, Motor Driven with tooling.

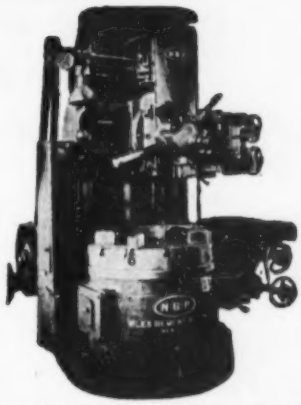


#2 WARNER & SWASEY Geared Head Turret Lathe, 12 Spindle Speeds, Bar Feed.

LATHE, Lo-Swing 8"x100", M.D., A.C. Rebuilt.
LATHE, Porter-Cable 9"x15" Geared Head Prod.
LATHE, #6 WSL Reid Smallpiece Prod., Late Type.
LATHE, LeBlond 14"x6', Q.C.G., M.D.
LATHE, Handey 14"x8' Q.C.G. Taper Attach, M.D.
LATHE, American 16"x6' Q.C.G., Grd. Hd. M.D.
LATHE, Lehman 18"x7' Q.C.G., M.D.
LATHE, American 18"x10' Q.C.G., Grd. Hd.
LATHE, South Bend 18/28"x8' Gap Bed, Q.C.G. M.D.
LATHE, Reed-prentice 20"x10' Grd. Hd. M.D.
LATHE, 20"x16' Reed Prentice Grd. Hd., Late Type
LATHE, LeBlond 22"x10' Q.C.G., M.D.
LATHE, 24"x10' Axelson Grd., Late, M.D.
LATHE, 24"x12' Boye & Emmes Grd. Hd., T.A., Late
LATHE, Putnam 25/32"x12' Q.C.G., M.D.
LATHE, LeBlond 24"x14' Q.C.G., Grd. Hd.
LATHE, Lodge & Shipley 26"x14', Q.C.G., M.D.
LATHE, Bridgeford 27"x12' Geared Head, M.D.
LATHE, 27"x10' Niles Timesaver, Grd. Hd., M.D.
LATHE, Bridgeford 32"x16' Q.C.G., Grd. Hd.
LATHE, 42"x18' Pittsburgh Geared Head, M.D.
LATHE, Buffing Dble. End #VMT5, Devine Bros.
LATHE, Turret #1 Bardons & Oliver Electric Head.
LATHE, Turret, #2 Simmons Vari Drive 220 V.
LATHE, Turret #2 W & S Univ. Grd. Hd., Late.
LATHE, Turret, #4 Warner & Swasey Univ. 1½".
LATHE, Turret #5 Warner & Swasey Univ. Late.
LATHE, Turret #8 Warner & Swasey Grd. Hd. Ram Type, Bar Feed, Motor in base.
LATHE, Turret #2 Cinci. Acme Univ. Geared Head.
LATHE, Turret #3A Warner & Swasey Univ. M.D.
LATHE, #801 Oster Hand Turret, M.D., Late Type.
LIFT TRUCKS, 1 & 2 ton, Platform & Fork.

MILL, #1-14 Kent-Owens Hyd. Late Type.
MILL, No. 1 U. S. Hand Mill, M.D. Late.
MILL, No. 1½ Milwaukee Plain Horiz.
MILL, #2 Kempsmith Maximiller Horiz., Vert. Hd.
MILL, #0-8 Cinc. Vert. Prod. Rotary Table.
MILL, 2M Cincinnati Univ. Horiz. M.D.
MILL, #3B Brown & Sharpe Vertical, M.D.
MILL, #3B K & T Horiz., M.T.S.
MILL, #3B K & T Vert. M.D.
MILL, #3VB Hardinge Vert. Bench, M.D.
MILL, #4B Brown & Sharpe H.D., Horiz. M.D.
MILL, #14 Garvin Plain Horiz., M.D.
MILL, #0Y Brown & Sharpe Plain Horiz., M.D.
MILLING MACHINE, #2B K & T Horiz., M.D.
MILL, Cinci. Horiz. #3, #4, High Power, M.D.
MILL, #1 Brown & Sharpe Plain Horiz., M.D.
MILL, #0-8 Cinci. Vert. Prod. Late, M.D.
MULT-MILLER, U.S. Tool #MM-1-8 Auto. Prod.
MILL, No. 0 Brown & Sharpe Plain Horiz.
MILL, #0 Douglas Plain Horiz. M.D., Coolant.
MILL, #0 Sundstrand Rigidmil Hyd., Late Type.
MILL, #0 Vernoc Hand Mill, M.D., Late.
MILL #0-8 Cinc. Horiz. Rise & Fall, Late.
MILL, 2A Brown & Sharpe Horiz. Univ., M.D.
MILLING MACHINE, Kempsmith #2 Horiz. Univ.
MILL, #3 Cinc. Univ. Horiz., M.D.
MILLING MACHINE, LeBlond #4 Horiz. Univ.
MILL, #2 Vert. M.D. Brown & Sharpe.
MILL, #3 Cinci. Vertical HI Power, M.D.
MILL, #5C Becker Vert. Die Sinker, M.D.
MILL, 42"x36"x12" Ingersoll Planer Type, 4 hds.
MILLING MACHINE, #2 Van Norman Duplex, M.D.
MOTOR GENERATOR SET, Gen. Electric, 100 K.W.
NIBBLER, #136 Savage 36"x3/16" Cap., M.D.
NAILING MACHINE, No. 18—45°-54° Morgan, Late

THREADING, Staybolt Lassiter Millholland 1½".
THREAD MILL, 7½x11 Hanson-Whitney, Univ.
THREAD MILL, 6x14 Pratt & Whitney No. 1105.
THREAD MILLER, Plan-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine, Late



36" x 44" Niels Vertical Boring Mill, Side Head, Motor Driven.

#40A Lees-Bradner Automatic Chucking Thread Mill, Motor Driven, Late Type.

PAPER SHREDDER, No. 10 Mitts & Merrill, M.D.
PLANER, Cincinnati 36"x36"x12' A.C., M.D.
POWER CRSS, Bliss #3A S.S. Dble. Back, M.D.
POWER PRESS, Bliss #3A S.S. Dble. Crank Grd. 45 tons, 4" stroke, 36"x20" Bed Area, M.D.
POWER PRESS—Bliss-Consolidated #183-B Straight Side Dble. Crank 45 tons, M.D.
PRESS, D72 & DG73 Ferracute, Redraw, M.D.
PRESS, #2½ & #5 Toledo, OBI, Motor Driven.
PRESS, #5 Johnson OBI, 60 tons, new.
PRESS, #7 & #8 Johnson OBI 75 & 90 tons, New.
PRESS, #59½ Toledo Str. Side, M.D., 440 tons cap.
PRESS, 70H & 125PA Drake Hyd. Arbor, New.
PRESS, #78½ Bliss Str. Side, 400 ton cap. M.D.
PRESS, Bliss #18, #19, #20, #21, OBI, A.C., M.D.
PRESS, Waterbury-Farrel High Speed 60 tons #3W.
PRESS, 66 C Bliss Double Action, 3 crank.
PRESS, Lucas 15 tons Power Arbor, M.D.
PRESS, #68 Whitney Deep Thr. 24", foot.
PRESS, P2, P3 Ferracute M.D. Roll feed.
WHEEL PRESS, 600 ton Niles-Bement-Pond, A.C.
PANTOGRAPH, #1A Gorton M.D. Engraving.
PUNCH, #46 Buffalo Forge Vert. Cap. 1"x1½" M.D.
PUNCH, R-4 Wiedemann Turret, 10 Stat. 24" thr.
PUNCH, Hecker Turret, 8 station, cap. 2½" hole.
PUNCH, H & J #2 Sgle. End. 24" Thr. (¾ thru 1".

RIVET SETTER, #140 Chicago M.D. ½" cap.
ROLLS, #1 Buffalo Forge Wrapping, M.D.
ROLLS, #1, #2 Buffalo Forge Vert. Angle Bending.
ROLLS, 72"x¼" Lown Initial M.D., New.

COLD SAW, Wagner 10"x10" cap., M.D.
COLD SAW, Espen-Lucas #700, 48" dia. blade, M.D.
CUT-OFF SAW, Radice "J" DeSanno.
CUT-OFF SAW, Yates-American #M-90, M.D.
SAW, #6 Marvel Bandsaw, 18"x18" cap.
SAW, #4B Marvel Hack Saw 6"x8" Cap., M.D.
SAW, #20-C Racine Shear Cut 8"x9" cap., M.D.
SAW, 16"x10" Racine Hyd., Late Type, M.D. #30C.
SAW, Band Tannewitz GH-30" High Speed, M.D.
SAW V-20 DoALL Bandsaw, Late.
SHAPER, 16" Newark, Vise, M.D.
SHAPER, 20" Gould & Eberhardt V-ways, Vise, M.D.
SHAPER, 16" Pratt & Whitney Crank, M.D.
SHAPER, 20" Rockford Univ. M.D., Tilting Table.
SHAPER, 32" Cinci., B.G., Motor Drives, M.D.
SHAPER, Morton, 36" Draw-Cut, 4 speed M.D.
SHEAR, 6' x 14 ga. Parker M.D., Late Type.
SHEAR, #26 Buffalo Forge Slitting Armor Plate.
SHEAR, Quinkwerk #11 Rotary 60" Throat, 10 ga.
SCREW SLOTTER, #2 Waterbury Farrel Auto.
SLOTTER, 12" New Haven Vertical M.D.
SPOTTER & SCRAPER, Anderson Power Unit, Late.
SPRU CUTTER, Milwaukee 56 tons, 2½ cap., M.D.
SURFACE PLATES & TABLES, all sizes.
TAPPER, #1 Cam Haskins, Motor Driven, Late.
TAPPER, #1 Bakewell (Warner & Swasey) Late.
THREAD ROLLER, #2B, #3B Waterbury Farrel.
TRUCK, 2000 lbs. Hyster Fork Lift 9' Model GT-20.
TRUCK, 4000 lbs. LT-44 Towmotor Fork, Lift 9'.
BRINELL TESTER, Type 6BDR, Steel City.
WELDER, 500 amp. Westinghouse Flexarc A.C.
WELDER, 200 & 400 amps. Gen. Elec. Portable Arc.
WELDER, 75 KVA Federal M.D., Spot.
WIRE STITCHER, Morrison & Acme, M.D.

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BALANCERS
GISHOLT 3S Dynetric, 1942.

BENDING ROLLS
SOUTHWARK 20'x1" Pyramid Type, Drop End, Balance Bar.

BORING BAR
CINCINNATI GILBERT 3½" Floor Type, with Outboard Bar Support, 1942.

BORING MACHINES
HEALD #49 Double End Bore-Matic, 1942. 2 available; one with Hyd. Cross Slide.

DRILLS
AVEY 6-Spindle No. 2MA6 Power Feed, No. 2 MT, 12" Overhang, 1943.
BAUSH No. 47, 16 Adjustable Spindles, Hydraulic Table, Tapping, 1948.

GEAR EQUIPMENT
FELLOWS 61A Gear Shaper, 1941. 2 available.
PRATT & WHITNEY 10" Hydraulic, 2 Wheel Gear Grinders (2), 1941.

GRINDERS, CYLINDRICAL
SCHMALTZ 30"x48" Hydraulic, 1939.
NORTON 10"x18" Type C Hydraulic, 1942.
BROWN & SHARPE No. 5 3"x12" Plain with Plunge Grinding, 1941.

GRINDERS, INTERNAL
HEALD No. 70A3, 1940.
HEALD No. 72A3 Gagematic; 2 available, 1940.

LATHES, AUTOMATIC & PRODUCTION
GISHOLT No. 12 Automatic Hydraulic, Direct Spindle Drive, new 1946.
LODGE & SHIPLEY 3A Duomatic, 1946.
SENECA FALLS Model R-14 Lo-Swing, 1942.
SENECA FALLS Model LR Lo-Swing, complete, 1942.

LATHES, ENGINE
NILES 30"x144" centers, Timesaver T.A. Chuck, 1941.

LATHES, TURRET
GISHOLT No. 3 ram type universal bar and chuck, 1942.

MILLS
KEARNEY & TRECKER 2K Vertical, 1943.
KNIGHT No. 40 Vertical, with Jig Boring Equipment; 2 available, 1942.
CINCINNATI 56-90 Plain Hydromatic.
KEARNEY & TRECKER Model 1H—18" Manufacturing Mill, 1941.

TAPPER
BAKEWELL No. 1, 1941.

. . . TELEPHONE MOnroe 6-7715 . . .

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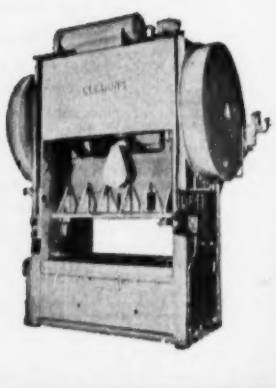

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MILLING MACHINES
CINCINNATI, 34-36 Hydromatic Duplex, Tracer Controls both spindles, Excellent. New 1941.
GORTON, 9-J Vert. Spdl. P.F., 1942.
KEARNEY & TRECKER 2H, Univ., D.H., 1942
KEARNEY & TRECKER, 2H and 2H, Plain, 1942
KEARNEY & TRECKER, 1H—18, mfg. new 1943
DEFIANCE, Duplex Hyd., 18"x48" table, timk.

GRINDERS
CINCINNATI 14"x36" Univ. Cyl., 1945.
LANDIS, 16"x32", Hydraulic Crankshaft.
LANDIS, 16"x42", Hydraulic Crankshaft.
MATTISON, 14"x16"x48", surface, check, 1944
EXCELLO 33-L, precision thread, new, 1943

SHEARS & BRAKES
DREIS & KRUMP, 408-D, 8'x3/16" Press Brake
CINCINNATI, 10x¼", 18" gap, hyd. hold-down
TRINLER, 64"x¼", Allsteel Hydraulic, New 1945
NIAGARA, 60"x¼", Gauges, Holddown, M.D.
NIAGARA, 36"x10 Ga., 15" gap, M.D.
New 2½ IRONWORKER, Notcher & Coper. In stock. Immediate Delivery.

TURRET LATHES
BARDONS & OLIVER, Nos. 4 & 7, bar & chuck
BULLARD, 36" Vert., Spiral Drive, 1914
GISHOLT, No. 4, Prescisector, Bar Feed, 1942
GISHOLT, 2L, cross sliding turret, tooling, M.D.

DRILL PRESSES
BARNES, No. 282 two-spindle, 1943.

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CEntral 6-3139

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3'11" DRESES Radial Drill—Motor on arm
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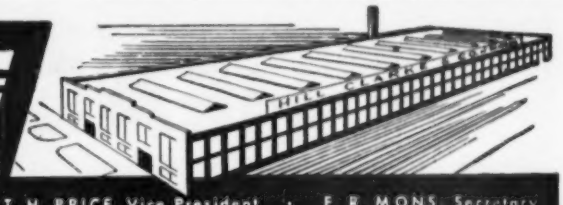
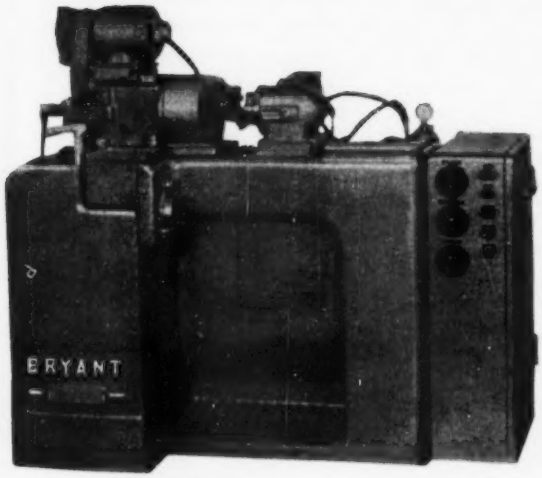
30"x16' bed AMERICAN High Duty Geared Head Lathe
42"x15' AMERICAN Heavy Duty Lathe
42"x25' centers AMERICAN Heavy Duty Lathe
No. 5A BRYANT Internal Grinder
No. 172 HEALD Gap Internal Grinding Machine for large swing
6"x18" LANDIS Type C Plain Grinder
10"x72" LANDIS Type C Hydraulic Plain Grinder —1942
12"x18"x40" THOMPSON Type B Hydraulic Surface Grinder
Nos. 4D & 6S POTTER & JOHNSTON Automatic Lathes
Nos. 8A and 9A JONES & LAMSON Saddle Type Universal Heavy Duty Turret Lathes
No. 26 VAN NORMAN Plain Miller
No. 2 CINCINNATI HS Dial Type Plain Millers
No. 0-8 CINCINNATI Plain Milling Machines
No. 2M CINCINNATI Vertical Miller, 1941
No. 1-18 CINCINNATI Plain Mfg. Miller
No. 12 B&S Plain Bed Type Production Miller
6"x60" P&W Model C Thread Miller
Nos. 64 and 72 FELLOWS High Speed Gear Shapers
No. 12 FELLOWS Gear Shaver 1943
No. 36BM GOULD & EBERHARDT Gear Roughers
16/20" GOULD & EBERHARDT Industrial Shaper
36" OHIO "DREADNAUGHT" H.D. Shaper.
100" BETTS Vertical Boring Mill, 2 heads.
50-ton HENRY & WRIGHT Dieing Machine, 1948.

WIGGLESWORTH INDUSTRIAL CORPORATION
203 Bent St., Cambridge 41, Mass.

HILL-CLARKE MACHINERY COMPANY



ESTABLISHED 1867 · W. L. DITFURTH, President · T. H. PRICE, Vice President · E. R. MONS, Secretary



BEAUTIFUL CONDITION

LATE 1951 MACHINE

NO. 1109 BRYANT INTERNAL GRINDER

Total chuck swing 9 inches. Max. traverse stroke 6", max. grinding length 3½", self-contained electrical equipment with high frequency wheel spindle.

AUTOMATIC

1-1/16" Model A Cleveland (1942)

DRILLS

1 Spdl.—14" Sw.—No. 2 Avey Cam Fd.
1 Spdl.—30" Sw.—No. 4 taper Aurora
2 Spdl.—24" Sw—No. 3 Avey
12 Spdl. D-31 Fox, No. 2 Taper

GEAR MACHINES

No. 12HS Gould & Eberhardt Hobber
11" Gleason Bevel Gear Generator
No. 36-BM G & E 3 Spdl, Rougher
No. 612-A Fellows Gear Shaper
No. 615-A Fellows Gear Shaper
No. 64 Fellows Gear Shaper
No. 65 Fellows
8" cap Red Ring Gear Lapper

GRINDERS

6" x 18" Landis (1942)
6" x 18" Norton Cylindrical (1943)
10" x 36" Norton Type C
10" x 36" Norton Type C Cam. Grdr.
10" x 48" Norton type C (1943)
14" x 36" Norton Universal Grd.
Hill-Clarke Cylindrical Grinders
10" x 36" centers
10" x 72" centers
10" x 96" centers
14" x 36" centers
14" x 50" centers
14" x 72" centers
14" x 96" centers
18" x 96" centers
18"-30" gap x 96" centers
24" x 264" centers
No. A-3—12" Arter Rotary Surf.
No. 1109 Bryant Internal Grd. (1951)

YOUR WORN MACHINES CAN BE "NEW" AGAIN

•

HILL-CLARKE
Gives You the Finest Re-manufacturing Obtainable

•

CONSULT US ABOUT REBUILDING YOUR OWN MACHINES

No. 5 Bryant Internal Grd.
No. 5B Bryant Internal Grd.
No. 16-16 Bryant Internal Grd.
No. 16-A-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 16 A-28 Bryant Internal Grd.
No. 16 F-28 Bryant Internal Grd.
No. 24-26 Bryant Internal Grd.
No. 24-36 Bryant Internal Grd.
No. 81 Heald Centerless Internal
No. 74 Heald Internal Centerless

BORING MACHINES

54" Ingersoll Vert. Adjustable Rotary Mill
No. 45—4½" bar G & L Hor. Bor.
100" Niles-B-Pond Vert. Bor., Mill

LATHES

16" x 33" R-14 Seneca Falls Auto Lathe
18" x 6' American Geared Head Lathe
18" x 8' Lodge and Shipley
19"x8' LeBlond Mfg. Tur. Lathe
27" x 12' American Geared Hd. Lathe
27" x 12' centers LeBlond Lathe
36" x 18' Putnam Grd. Hd. M.D.
5W Acme Ram type Tur., 2" Capacity
No. 6 Warner & Swasey Tur.-Bar Fd.
18" Libby Tur. Lathe, M.D.
No. 3AL Gisholt Cross-Slide Tur.
No. 4A Warner & Swasey—7⅛" Hole Spdl.
No. 4A Warner & Swasey, Taper, (1944)
No. 4A Warner & Swasey, Taper, Cross-Slide (1942)

MILLING MACHINES

No. 3K Milwaukee Vert. Mill (1942)
No. 08 Cincinnati Vert. Mill (1942)
54" x 30" x 16' Ingersoll Slab Mill
6" x 168" Pratt & Whitney Thrd. Mill
10" x 48" Hanson-Whitney (1942)
10" x 60" Pratt & Whitney Thrd. Mill
12" x 102" Lees-Bradner Thrd. Mill

PLANERS

48" x 36" x 14' Gray, 2 hds.
48" x 48" x 12' Cincinnati, 2 hds.
60" x 48" x 27' American, 4 hds.

MISCELLANEOUS

No. 4B Marvel Hacksaw
Model No. 2 Micro. Horiz. Hone
42"—18 gage Economy Power Shear
75 Ton R & K Straight Side Press
2—12" x 96" Magnetic Chucks
20' x 1" cap Southwark Roll
15" Dill Slotter
18" Dill Slotter
38" Morton Draw-Cut Shaper (1945)

FULL MONEY-BACK GUARANTEE

1. Hill-Clarke always give you an unconditional money-back guarantee.
2. All machines in stock.
3. You can see your machine run and tested under power in our plant before purchasing.
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5. A responsible organization — established 1867.

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HEADLINERS

Reasonable Prices

MILLING MACHINES

No. 3-B Brown & Sharpe Heavy Plain, a.c. m.d.
No. 4-B Heavy Brown & Sharpe Plain, a.c. m.d.
No. 4 Cincinnati "High Power" Universal, a.c. m.d.
No. 4 Cincinnati "High Power" Vertical, a.c. m.d.
No. 36 Van Norman Ram Type, div. hds., a.c. m.d., 1943
No. 1-14 Kent-Owens Hydraulic, a.c. m.d., 1940

LATHES

36"x120" ctrs American 12-speed Grd. Hd., a.c. m.d., taper
36"x96" ctrs Schumacher & Boye Triple Geared, cone, taper
22"x72" ctrs Lodge & Shipley 12-speed Selec Grd Hd., a.c. m.d., taper
19"x48" ctrs LeBlond H.D. 12-speed, a.c. m.d., taper

PLANERS

42"x42"x14' Niles-Bement-Pond Heavy Pattern, d.c. reversing drive, four heads, box table
42"x42"x16' Gray, arranged m.d., two heads

RADIAL DRILLS

5'-13" col. Dreses, cone drive
6'-16" col. Dreses Full Universal, a.c. m.d.
7'-17" col. Dreses, a.c. m.d.

GRINDERS

Model A-1-8 Arter Rotary Surface, a.c. m.d., new 1943
No. 49—53" Besly Vertical Spindle Disc, motor on spindle
10"x24" Landis Plain self-contained, a.c. m.d.
10"x48" Type C Landis Plain Hydraulic, hydraulic in-feed, plunge cut, reciprocating wheel spindle, new 1941

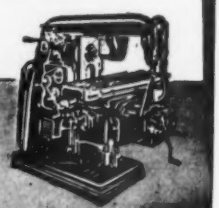
GEAR MACHINERY

No. 3—26" Brown & Sharpe Gear Cutter, a.c. m.d.
No. 5-A Cincinnati Gear Cutter, a.c. m.d., capt. 60"x16"
No. 18-H Gould & Eberhardt Hobber, a.c. m.d.
No. 7 Fellows High Speed Shaper, s.p.d.

MISCELLANEOUS

No. 2L Gisholt Turret Lathe, a.c. m.d., Timken, hard ways
No. 12-B Pratt & Whitney Single Spindle Profiler, a.c. m.d., 1943
1¼" Cone 4-spindle Automatic, a.c. m.d., bar feed
24" Bullard "New Era" Vertical Turret Lathe, arr. m.d., threading
Style B Long & Alstatter Double End Angle Shear, capt. 6"x6"x1"
No. 3 Cleveland Bar Shear, capt. 2½" round

We have many other machines of all types in stock. Send us your inquiries. Phone: JUniper 3091



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Office&Warehouse 311-313 Bakewell St.,Covington,Ky.

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Brown and Sharpe Hobber, No. 44, serial No. 104 with Crocker Wheeler Motor, serial No. 748275. Equipped to cut spur and spiral gears and splines.

Schuchardt and Schutte Hobber, 36" CAP TP #2, serial No. 6706. Equipped with differential for cutting spur, spiral, and worm gears.

60" Reinecker Hobber, RF No. 4N, Serial No. 6937/1. Completely rebuilt. Equipped with Tangential feed and differential.

These hobbers now being used in production and in excellent condition. Can be seen in operation.

1—Monarch Lathe 12" and serial No. CK 3919.

1—Monarch Lathe 14", serial No. C-5239.

All of the above equipment motorized, 220 volts AC, 3 phase.

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Reeves Drive
Excellent Condition

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1941-1953 MACHINE TOOLS

IMMEDIATE DELIVERY — NO PRIORITIES NEEDED

CAM MILLERS
VAN NORMAN: 10CT Contour Miller horizontal opposed spindle type for milling flat cams, also can be converted to similar work

CENTERING MACHINES
SWEDISH: Double-End, 42" & 60" new
SUNDSTRAND: Double-End, #53, 24" Centers.

CUTTER & TOOL GRINDERS
ARTER: Carbide Tool Grinders No. 200
CONSTAN: Carbide Tool Grinder No. 178, new
FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: 10" Template Tool Bit
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New) automatic indexing

DRILLING MACHINES
ALLEN: No. 2 Drill—6 Spindle
ALLEN: #2 High Speed 15" overhang
PRATT & WHITNEY: ½B x 50 Deep Hole Drilling & Reaming Machine, 2-spindle
RADIAL DRILLS: Archdale, 5', 6' and 7', new

GEAR CUTTING MACHINES
FELLOWS: 64A Shaper, 18" dia.
FELLOWS: Flat Top Helical Gear Cutter Grinder
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Gen.
GLEASON: 3" Straight Bevel Gear
SYKES: Gear Shaper 14" external, 20" internal (New)
SYKES: Rack Cutting Machine 12" to 36" length capacity (New)

GEAR AND SPLINE GRINDERS
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH: GG-19, 10" x 24" Hydr. Spur Gears and Splines
INTERNAL GEAR GRINDER, GG-31

GEAR FINISHERS & TESTERS
FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical
FELLOWS: #12C Cone & Spacing Inspection Instrument
GLEASON: No. 3 Bevel Gear Tester
GLEASON: No. 4 and No. 6 Bevel Gear Testers. Hand and Power
NATIONAL BROACH: SIC-12" Red Ring Gear Testing Machine

GRINDERS—CYLINDRICAL
BROWN & SHARPE: No. 10 capacity 6"x18" plain
CINCINNATI, 6"x18" Hydraulic, Plain
LANDIS: 16x32" Type "D" Crankpin, hydraulic, for grinding crankshafts
NORTON: 10"x18" 45° angle wheel

3-WAY GUARANTEE
1. Should any machinery purchased from us prove unsatisfactory, you can return the machines within 20 days, via freight prepaid to our plant, and a full refund will be made.
2. Machines at our plant can be demonstrated and tested under power before purchasing.
3. You are dealing with a well-established, highly-rated firm of machinery engineers with over 33 years of proven responsibility.

GRINDERS—CENTERLESS
#73 Heald Centerless Internal Grinder

GRINDERS—GEAR & SPLINE
GEAR GRIND MACH.: GG-19, 10"x 24" Hydr. Spur Gears and Splines
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
INTERNAL GEAR GRINDER, GG-31

GRINDERS—INTERNAL
BRYANT: 16-16 Internal Hydraulic
BRYANT: No. 5Y Internal
HEALD: 72A3 Sizematic Centerless

GRINDERS—RADIUS
VAN NORMAN: #73, capacity 7½"
VAN NORMAN: #649-16, capacity 6" to 16" diameter
VAN NORMAN: #3½ Un. Radius

GRINDERS—THREAD
EXCELLO: #31 External, dia. 5"x18"
JONES & LAMSON: #636 Universal, 6" dia. x 36" centers and one extra multiform wheel dressing attachment

HONING MACHINES
MICROMATIC: H-510 Double End Horizontal, ¾" to 2" dia.
MICROMATIC: H-2 Single End Horizontal, 2 spindle, ¼" to 1" dia.

LAPPING MACHINES
FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical

LATHES PRODUCTION
BLOUNT: Polishing speed lathe 12" dia. x 48" centers
H.E.B.: High production hydraulic duplicating and copying lathes (new)
LODGE & SHIPLEY: #3A Duomatic, 25½" swing x 27" centers
TRIPLEX Tool Room Lathe, 14"x60", new

LATHES—TURRET
WARNER & SWASEY: 1A & 3A
WARNER & SWASEY #3 & #5
HERBERT: #0, #2, #4, #7, #8 and #9B/30 Sizes, new
WEBSTER & BENNETT: Vertical Turret Lathes 36" & 48" (New)

MILLING MACHINES
CINCINNATI: Hydromatic Duplex Rise & Fall, Model 34-36, Tracer Control
TAYLOR-FENN: M-80 Duplex Spline
RICE-BARTON: 4" Twin Spline
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

SAWS & CUT-OFF MACHINES
CAMPBELL: Model 401 Cutamatic Abrasive Cut-Off
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
RUSSELL: 5½" dia. cut-off saws, auto stock feed, hydraulic (New)
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed

THREAD MILLERS & TAPPERS
HALL PLANETARY: Model "D" Thread Miller
LANDIS: 2½" single head horiz. threading machine
LEES-BRADNER: #40A Thread Miller
LEES-BRADNER: CT-36 Thread Miller chucking type, 13½" hole
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity, single spindle
NATCO: Vertical Tapper 16 spindle

WIRE FORMING MACHINES
HEENAN & FROUDE 4-slide machines, new
HEENAN & FROUDE Paper Clip & Staple Machs., new
Nilson #1F, 4-slide wire forming

MISCELLANEOUS
ARTER CARBIDE Tool Grinders, No. 200
OPTICAL PROFILE GRINDER, Wickman, New
OPTICAL PROFILE GRINDER, Sheffield, used
AUTOMATIC SCREW MACHINE, Swiss type, ⅝"—used
AUTOMATIC SCREW MACHINE Wickman, Single Spindle, 7/16", New
RACK CUTTING MACHINE: Sykes 12" to 36" length capacity (New)
CUT-OFF: Russell 5½ & 9½" cut-off saws with auto. stock feed (new) hydraulic
TEST STAND: Denison 918-AM Hyd.
LATHES: Blount Polishing Speed Lathe 12" dia. x 48" centers
HARDNESS TESTER: Gogan Brinell, Model 16-8
SHEFFIELD Precisionaire Gauge
CENTERING MACH., Swedish, Double-End, 42" & 60", new
SUNDSTRAND: Double-End, #53, 24" Centers
WIRE FORMING MACHINES: 4-slides (new)

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No. 8 SUNDSTRAND Stub Lathe, 1941
10" MONARCH Lathe, 1940
18x48 MONARCH Lathe, Ser. #16073, 1942
No. 5 WARNER & SWASEY Turret Lathe, 1940, Chucker
4A WARNER & SWASEY Turret Lathe, 12" Hole Cross Sl. Turret Lead Screw, Power Chuck, 1941
No. 30 GIDDINGS & LEWIS Boring Mill 3" Hor. w/2 aux., Ser. #4806
No. 3-36 CINCINNATI Production Mill
No. 2 CINCINNATI Univ. Grinder, T & C, 1943
4H LANDIS Grinder, Plunge, 4x18, 1942
6x30 CINCINNATI Grinder, Plunge Cut, 1943
10x96 NORTON Grinder, Hyd., 1942
Mod. 7125A FELLOWS Gear Shaper, Ser. #19713
2" GREENLEE 6 Spdl. Screw Machine, 1940
Mod. A 3¼" CLEVELAND Screw Machine, Late, 1942
8'9" CINCINNATI BICKFORD Radial Drill, 1941
No. 201¼ BARNES Drill, 1948
BUFFALO Angle & Bar Shear 15" I-Beams, 8"x8"x1¼" Angle, 4" sq. cap., 1944
16A BLANCHARD Grinder, 1944

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Ser. No. 3B53D1L-4

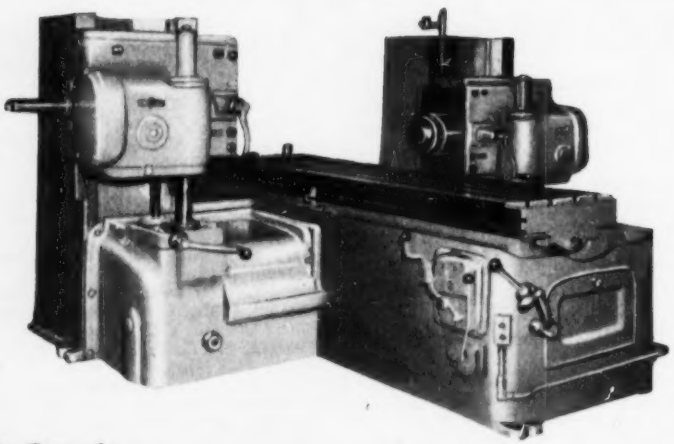

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Table working surface 26" x 89". Table overall 26" x 101½". #50 std. taper. Adj. of spindle 8". Spindle speeds 24-13 to 195 RPM. Feeds—inches per min. 0-30. Motor drive with motor and controls.

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LATE TYPE MACHINE TOOLS

No. 41 Lucas Horizontal Boring Mill. 1941.
HP-100 LaPointe Horizontal Hydraulic Broach. 1945.
No. 7 Gleason "Revex" Gear Rougher. 1943.
14"x48" Norton Univ. 1942.
No. 35 Excello Precision Thread Grinder.
No. 2 Cincinnati Centerless Grinder. 1944.
24-36-Bryant Hydraulic Internal Grinder. 1942.
No. 72A3 Heald Plain Hydraulic Internal Grinder. 1941.
No. 24 Mattison (Hanchett Type) Duplex Grinder.
No. 16A Blanchard Automatic Surface Grinder. 1942.
No. 6DRE Potter & Johnston Automatic. Late.
27"x192" Niles "Timesaver" Engine Lathe. 1941.
No. H5 Libby Universal Saddle Type Turret Lathe. 1939.
No. 3R Gisholt Universal Saddle Type Turret Lathe. 1942.
No. M-18 Kearney & Trecker Simplex Mill. 1943
650 Ton Verson Double Action Eccentric Press. 1940.

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INDIANAPOLIS 6, INDIANA

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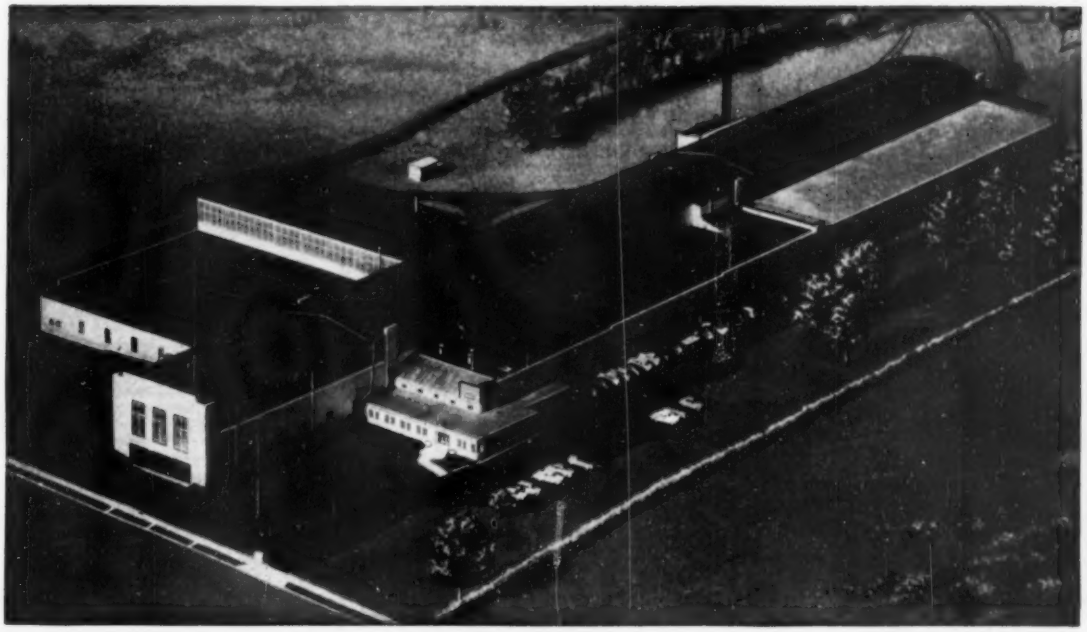

PLAIN CYLINDRICAL GRINDERS

6x15" Cincinnati Plain Hydraulic, m.d.
6x18" Cincinnati Model EA, m.d.
6x18" Landis Type C Hydraulic, m.d., late
6x30" Cincinnati Hydraulic, m.d.
10x18" Cincinnati Model EA, m.d.
10x36" Cincinnati Hydraulic, m.d.
10x72" Landis, m.d.
10x72" Norton, motorized
12x36" Landis, m.d.
12x96" Landis Plain Self-Contained, m.d.
14x18" Cincinnati Plain Self-Contained, m.d.
14x48" Cincinnati Plain Self-Contained, m.d.
14x52" Norton, motorized
16x72" Landis Plain, m.d.
16" raised to 26"x72" Type C Norton, m.d.
No. 20—10x18" Brown & Sharpe, m.d.
20x120" Landis Plain Self-Contained, m.d.

EMERY GRINDERS

3 H.P. Baldor Emery Grinder, Pedestal type
#516 Mummert & Dixon Radial Emery Grinder, m.d., 5 H.P. motor

UNIVERSAL CYLINDRICAL GRINDERS

No. 3 Brown & Sharpe Universal Grinder, m.d.
6x20" Fitchburg Hydraulic Spline & Gear Grinder, m.d., latest
16x24" Cincinnati Self-Contained, m.d.
12x48" Norton Universal, m.d., latest

CYLINDER GRINDERS

No. 50 Heald Hydraulic, m.d., 11-18" spindles
No. 55 Heald, m.d., 15-24" spindles
No. 73 Heald Cylinder Grinders, brand new, m.d.
Model FG Micro Cylinder Grinder, m.d.

SURFACE GRINDERS

No. 2B Brown & Sharpe, m.d.
No. 2 Brown & Sharpe, m.d.
Arter Model A-1-8" Rotary, m.d., latest
No. 121 Hanchett Production Face Grinder, type BD, m.d.
No. 22—12" Heald Rotary, m.d.
No. 33 Abrasive Vertical, m.d.
No. 260—16" Heald Rotary, belt
14" Pratt & Whitney Vertical, m.d.
Model A—12" O.S. Walker, m.d., latest

HAMMERS

8000# Chambersburg Steam Drop Hammer

INTERNAL GRINDERS

Model 5Y Bryant, m.d.
No. 16—16" Bryant, m.d., Hydraulic Hole Grinder
No. 16CR16 Bryant, m.d., latest
No. 16—22" Bryant, m.d., latest
No. 16—38" Bryant, m.d., latest
No. 24P—26" Bryant, m.d.
No. 24—21" Bryant, m.d.
No. 44 Heald Facing Type Borematic, m.d.
No. 72 Heald Sizematic, m.d.
No. 72A Heald Sizematic "Duplex", m.d.
No. 72A Heald Gagematic, m.d.
No. 72A3 Heald Sizematic, m.d.
No. 72A3 Heald Gagematic, m.d.
No. 72A5 Heald Sizematic, m.d.
No. 72A5 Heald Plain, m.d.
No. 73 Heald Airplane, m.d., latest, new
No. 74 Heald, m.d.
No. 81 Heald Gagematic, Sizematic, m.d.
No. 640—10" Van Norman Automatic Oscillating Radius, m.d., latest
No. 5 Bryant, m.d., latest

TOOL & CUTTER GRINDERS

Gisholt Universal Tool Grinder, belt
Union Twist Drill & Cutter Grinder
Type 66d Sellers Drill Grinder, m.d.
No. 0-2 GP Sellers Drill Point Thinning Machine, m.d.
Grand Rapids Tap Grinder, style 12M
Gleason Cutter, belt drive
No. 2A Wm. Sellers Universal Tool Grinder, m.d.
No. 2B Sellers Wet Grinder, m.d.
No. 2 Lumsden Oscillating Tool Grinder, belted m.d.
No. 4T Sellers Tool, m.d., latest
No. 5T Sellers Tool, m.d.
No. 1 J & B Tap Grinder, m.d.
Pratt & Whitney Deep Hole Drill Sharpener, m.d., latest
Gould & Eberhardt Gear Cutter Grinder, 2 step cone pulley belt drive

HONING MACHINES

H1 Micromatic Horizontal Hydrohoner, m.d.
H2 Micromatic Horizontal Hydrohoner, m.d.
H4 Micromatic Horizontal Hydrohoner, m.d.
No. 6 Barnes Twin Spindle
Model #182 Barnesdrill Hone, m.d., latest
Model 306H Barnes, single spindle

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42 Van Norman

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Norton 10"x18" Type C cylindrical, 6"x30" Cyl.
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Milwaukee 2H Universal, 2H Plain
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Sundstrand #3A Rigidmil with copying Attach, 33
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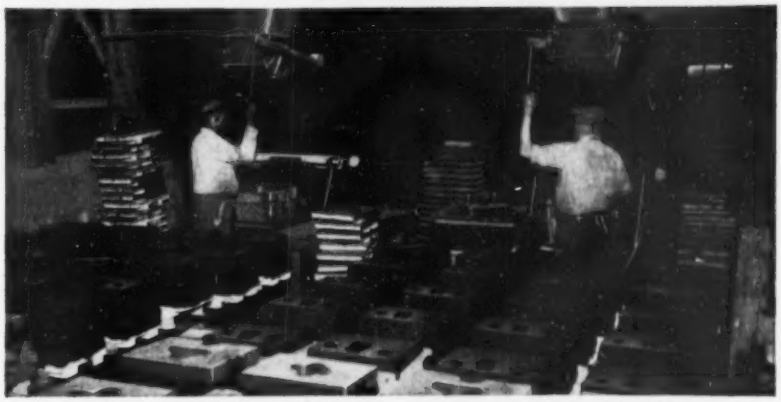

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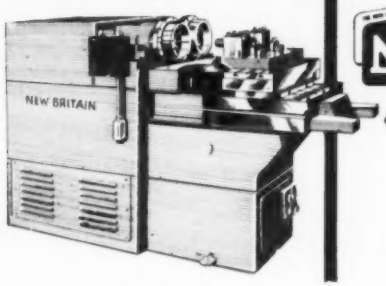

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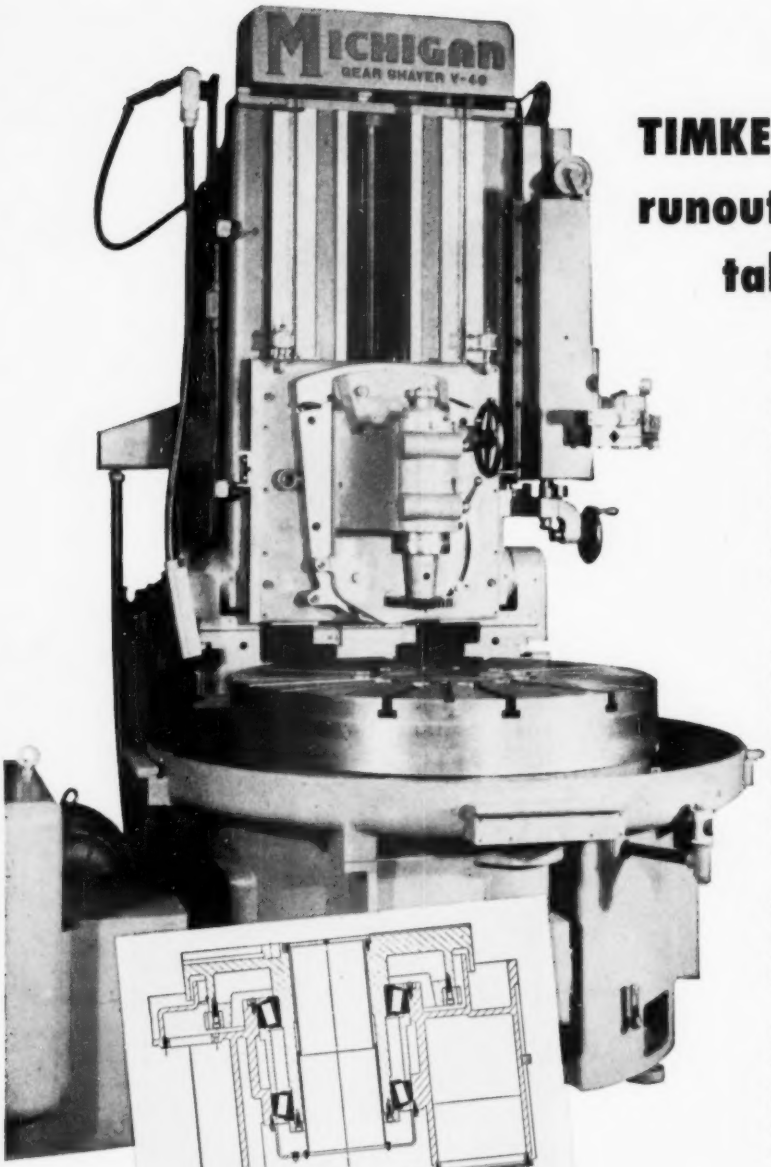

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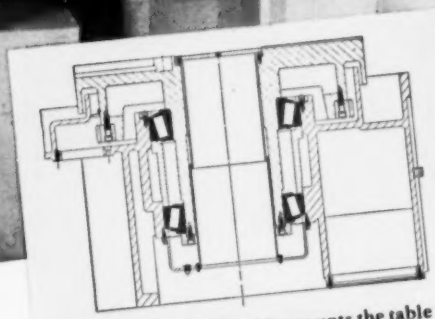

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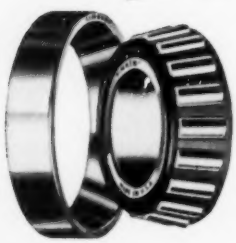

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